The Journal

OF THE

AMERICAN DENTAL ASSOCIATION

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THE MINUTE ANATOMY OF THE LOWER JAW IN RELATION TO THE DENTURE PROBLEM

By ELBERT C. PENDLETON,* D.D.S., M.D.S., Chicago, Ill.

THE results of clinical practice seem to indicate that the principal factor influencing denture design is the musculature intimately associated with the areas of support. While it is evident that the more remote structures may directly affect the phenomena of retention and stability, no doubt they should be considered accessory factors, as are the investing structures, fat and loose connective tissue.

The terms retention and stability are often loosely used. They are recognized as independent agents in the prosthetic denture problem. Retention implies a state of security since the artificial denture is kept in place by physical energy. Adhesion, a molecular attraction exerted between surfaces of bodies in contact, is generally acknowledged to be the dominant force affecting retention. Stability denotes a condition of equilibrium. It is that quality of firmness of the prosthetic denture, in relation to the supporting structures, that tends to restore it to its original position when acted upon by displacing forces.

Retention and stability, distinctive problems in denture prosthesis, are affected by varied elements generally cataloged as mechanical and biologic. Both the passive forces of leverage and the active forces of molecular contact and the atmosphere influence these elements.[1] The success of denture service depends largely on control of the mechanical factors in order that the biologic elements may perform a useful function. According to Wilson, the retention of complete dentures is in direct ratio to the surface covered. However, in covering the greatest possible area, the prosthesis must not encroach upon the musculature.[2]

As early as 1847, Herbert stated that

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From the Foundation for Dental Research of the Chicago College of Dental Surgery.

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"plates to be worn comfortably and without injury to the gums or remaining teeth should cover as great an area of surface as compatible with the circumstances of the case."[3] In the *Dental Cosmos* of 1862, H. Meredith White said that "the plates of artificial dentures should not encroach upon the insertion or origin of the various muscles that are attached to either jaw, or are near enough to the alveolar process to be liable to injury."[4] Thus, it may be seen that since the time of the earliest prosthetists, areal contact and freedom for muscle action have been recognized as fundamental prerequisites to the retention and stability of artificial dentures.

The minute structures of the jaws, the fat-contained connective tissues, the circulatory and interstitial fluids, all play a part in denture stability. They promote that tissue quality known as elasticity, which is the potential factor in equilibrium, maintaining a contact relationship between the supporting structures and the prosthesis.

Mechanical problems in denture prosthesis are studied with interest because of their close association with clinical practice. It is possible that the biologic elements have failed to be inspiring because gross anatomic structure, as understood, rarely conforms to the structures encountered in the edentulous state. Microscopic anatomy, like denture prosthesis, is an exact science. Therefore, it is imperative that the histologic structure of the edentulous jaws be understood to insure the success of prosthetic treatment. A relative concept of the

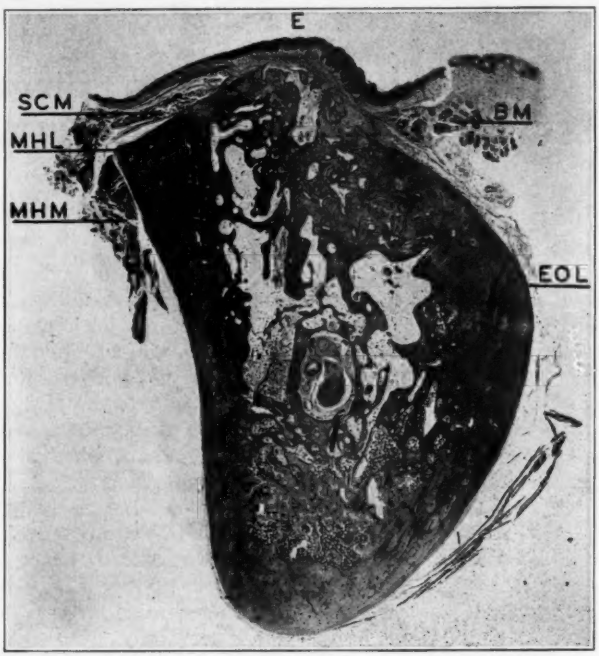

Fig. 1.—Frontal section in second bicuspid area of edentulous lower jaw from man aged 63. E, epithelium at crest of residual ridge. BM, buccinator muscle. EOL, external oblique line. MHM, mylohyoid muscle. MHL, mylohyoid line. SCM, superior constrictor muscle.

supporting tissues is knowledge too remote from clinical practice to be readily applied in denture prosthesis. The variable nature of the tissues of edentulous jaws has long been recognized as their outstanding characteristic. It is this feature of tissue change which appears as a sequel to the loss of the natural teeth and which is, no doubt, the least understood of all factors in the treatment of edentulous cases.

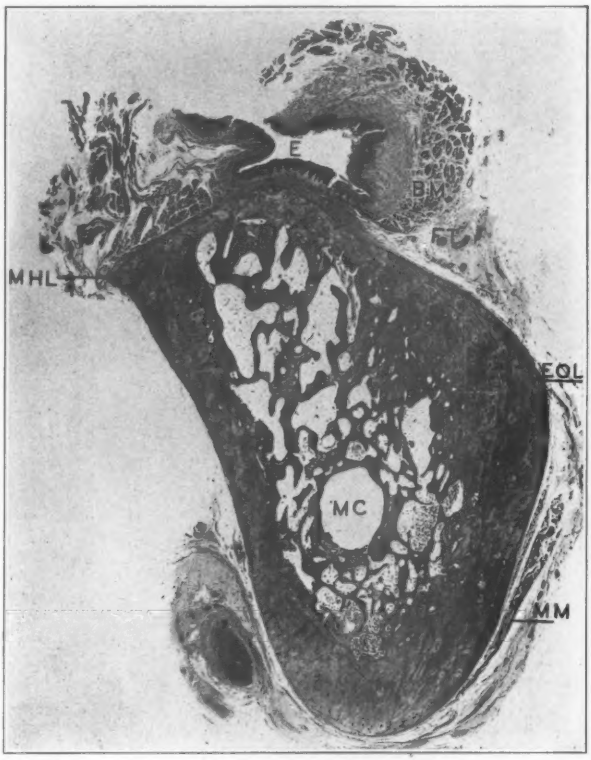

Fig. 2.—Frontal section in left second molar area of edentulous lower jaw from man aged 63. E, epithelium. BM, buccinator muscle. FT, fat tissue. EOL, external oblique line. MM, masseter muscle. MC, mandibular canal. MHL, mylohyoid line showing muscle fibers extending toward residual ridge that support prosthetic denture.

FACTORS AFFECTING THE MUSCULATURE

The form of the mandible is affected by its function during growth and development and by certain hereditary tendencies. After the loss of the natural teeth, the function of the edentulous jaw becomes limited and the restricted action of the parts affects the tone of the muscles. Changes in the form of the edentulous mandible appear to influence not only the attachments of certain muscles, but likewise the character of the attachments. It is important, in the treatment of edentulous conditions, that the operator be familiar with the peculiarities of muscles since their action limits the form of the artificial denture.

The muscles of the mandible intimately related to the prosthesis and having either or both periosteal or aponeu-

rotic attachments to the bone are: (1) the mentalis, at the labial surface; (2) the buccinator, at the molar buccal area; (3) the genioglossus, at the anterior lingual area; (4) the mylohyoid, at the bicuspid and molar lingual area, and (5) the superior constrictor of the pharynx, in the molar and, in rare instances, postmolar lingual area. These muscles may be potential factors in the support of the prosthesis or they may affect the retention and stability of the artificial denture.

The muscles of the mandible assist in supporting the prosthesis when their contact with the denture base occurs upon contraction of the structures during normal function. It is thought that the fat-contained connective tissues about the muscle fibers are important elements contributing to their elasticity and free movement. The location of the adipose

Fig. 3.—Frontal section in postmolar area of edentulous lower jaw. BM, buccinator muscle. FT, fat tissue. EOL, external oblique line. MM, masseter muscle. G, glands. LN, lingual nerve. MHM, mylohyoid muscle.

tissue and muscle attachments is considered in relationship to the anatomic landmarks of the mandible.

MANDIBULAR LANDMARKS

External Surface.—A slight ridge at the midline of the mandible (the symphysis) extends vertically from the inferior to the superior border of the bone. On each side of the symphysis, below the area formerly occupied by the incisor teeth, a depression (the incisive fossa) gives rise to the mentalis and a portion of the orbicularis oris muscle. The mental foramen is located in the bicuspid area at a position varying from the buccal surface of the bone to the crest of the residual ridge, depending on the state of resorption. In some cases, it may appear at the crest of the ridge as far posteriorly as

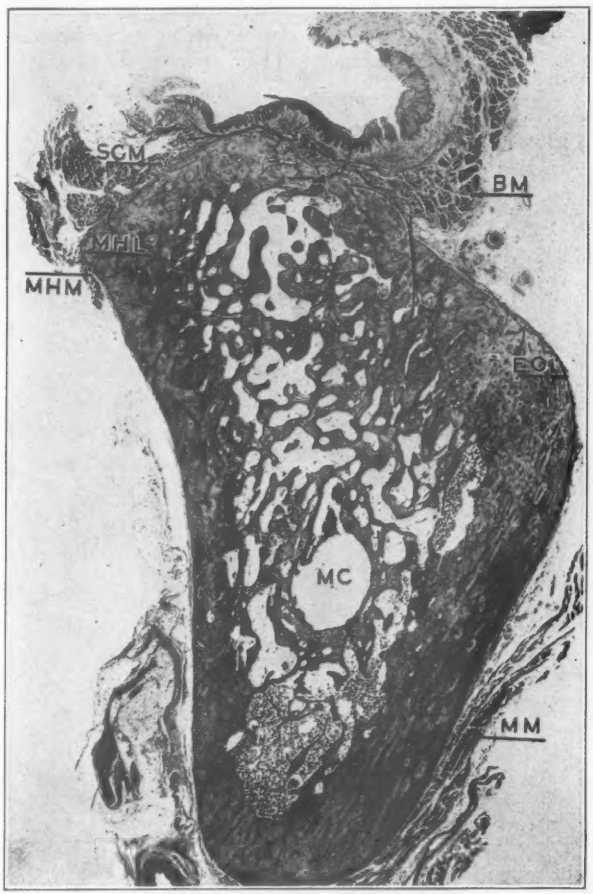

Fig. 4.—Frontal section in postmolar area of edentulous jaw. BM, buccinator muscle. EOL, external oblique line. MM, masseter muscle. MC, mandibular canal. MHM, mylohyoid muscle. MHL, mylohyoid line. SCM, superior constrictor muscle.

the molar area, presenting an extreme hazard to the patient's comfort in wearing prosthetic dentures.

Near the base of the mandible and included by the symphysis are the mental tubercles. Extending backward from these prominences and normally superior to the mental foramen, a ridge on the bone's surface is known as the external oblique line. This is a critical area in determining denture design owing to its proximity to the point of reflection of the buccinator muscle.

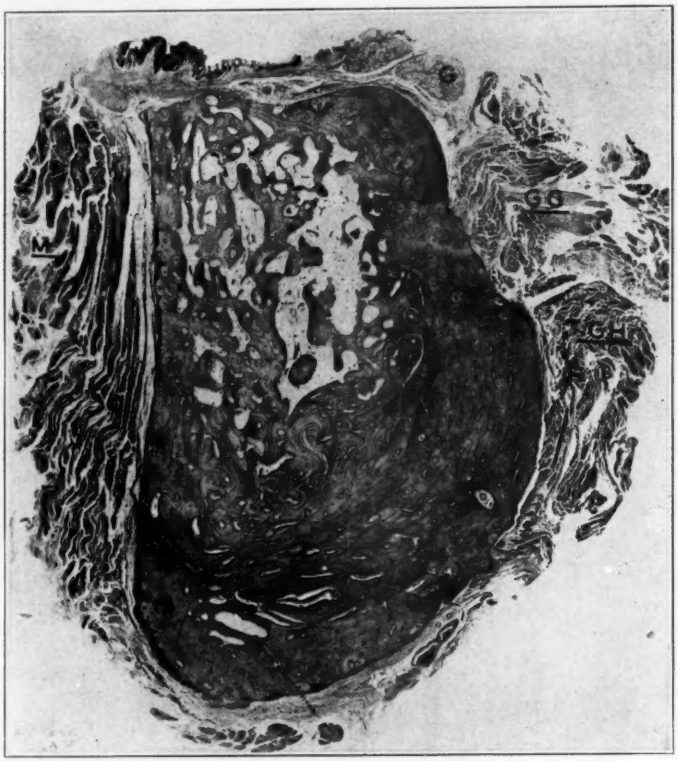

Fig. 5.—Sagittal section at midline of edentulous lower jaw from man aged 63. M, mentalis muscle. G, glands. GG, genioglossus muscle. GH, geniohyoid muscle.

Internal Surface.—On each side of the symphysis, a developmental union of the mandible, and at its inferior surface, the mental spines afford the bony attachment for the aponeurotic fibers of the genioglossus above and the geniohyoid muscles below, which form a part of the anterior portion of the floor of the mouth. Extending backward and inclining upward from the inferior portion of the symphysis, the mylohyoid line often becomes prominent, in the edentulous state, as it reaches the molar area. The mylohyoid muscle is attached throughout the extent of the mylohyoid line, and above it fibers of the superior constrictor of the pharynx usually find their attachment in the molar area. At the posterior portion of the mylohyoid line, the pterygomandibular ligament (raphe) is attached, separating the supe-

rior constrictor and buccinator muscle and affording attachment for some of their fibers.

MUSCLES INTIMATELY ASSOCIATED WITH DENTURE DESIGN

Serial sections of nine edentulous and partially edentulous human lower jaws were studied and measured with the aid of the microscope. The musculature and the character of their attachments were the chief problems in consideration. In a few sections, some details were inaccessible, creating minor breaks in the continuity of the records, which include: (1) the depth in millimeters of the mucosa of the ridge; (2) the attachment of the muscle by aponeurotic fibers; (3) the attachment of the muscle to the periosteum; (4) the lingual area covered by the muscle attachments; (5) the distance from the epithelial crest to the position of lingual muscle attachments; (6) the labiobuccal area covered by the muscles; (7) the distance from the position of the labiobuccal attachment to the crest of the epithelium at the residual ridge, and (8) whether or not the labiobuccal muscles are attached to the bone or appear as lip or cheek muscles.

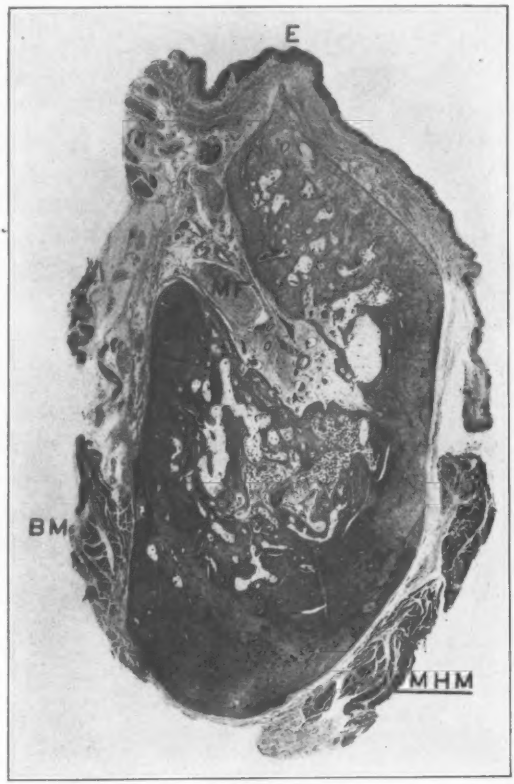

Fig. 6.—Frontal section at first bicuspid area of edentulous lower jaw. E, epithelial crest. MHM, mylohyoid muscle. BM, buccinator muscle. MF, mental foramen.

The relationship of the muscle attachments at the molar area was recorded as they appear above and below the mylohyoid and external oblique lines. The age and sex of the individuals from whom the specimens were obtained are registered on the accompanying tables.

With no thought of minimizing the importance of any single tissue or anatomic structure, the external oblique line and the mylohyoid line with their associated muscles are recognized as traditional landmarks in the construction of mandibular artificial dentures.

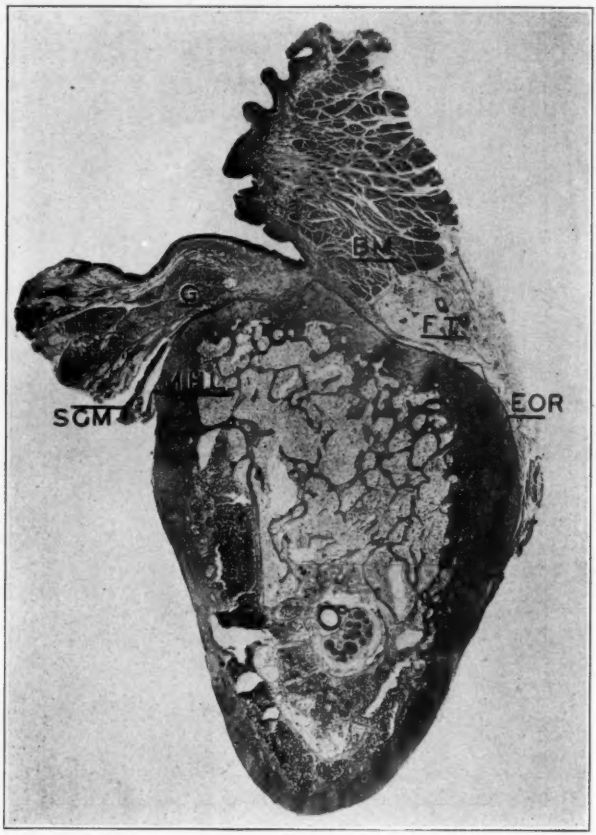

Fig. 7.—Frontal section at postmolar area from edentulous lower jaw of woman aged 51. BM, buccinator muscle. FT, fat tissue. G, glands. MHL, mylohyoid line with attachment of mylohyoid muscle. SCM, superior constrictor muscle covering broad surface of bone above mylohyoid line.

Some records were obtainable of both the right and the left side of the jaws. However, unless otherwise indicated, the surveys were compiled from the left side of the jaw.

MUSCLES OF THE MOLAR AREA

Because of the difficulties experienced in establishing the form and extent of the lingual and buccal borders of the prosthesis, the muscles at the molar area

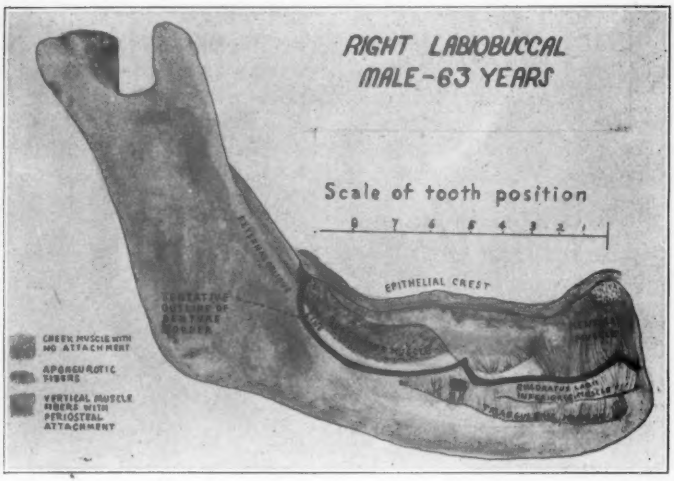
RIGHT LABIOBUCCAL
MALE-63 YEARS
Scale of tooth position
9 7 6 5 4 3 2 1
EPITHELIAL CREST
TENTATIVE OUTLINE OF DENTURE BORDER
BUCCINATOR MUSCLE WITH NO ATTACHMENT
APONEUROTIC FIBERS
VERTICAL MUSCLE FIBERS WITH PERIOSTEAL ATTACHMENT

Fig. 8.—Right labiobuccal structures of lower jaw in relation to tentative outline of border of prosthetic denture.

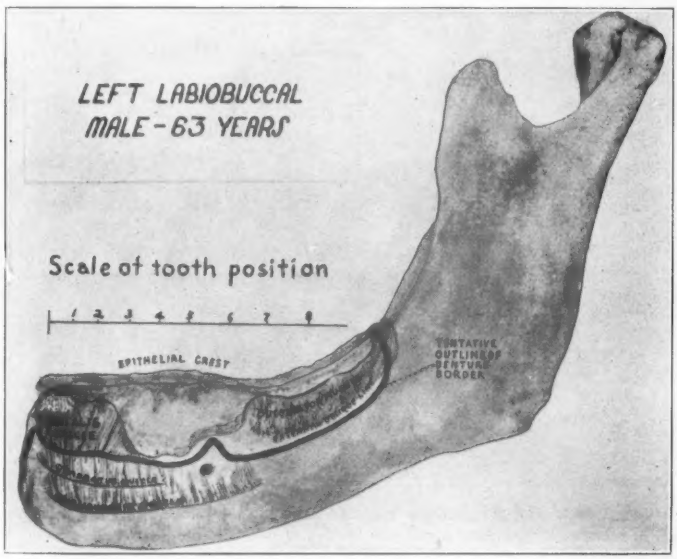

Fig. 9.—Correlation of left labiobuccal muscles according to scale in relation to tentative outline of border of prosthetic denture.

are given primary consideration. MacMillan has called attention to the extension of the fibers of the mylohyoid muscle above the mylohyoid line.[5] In clinical practice, this condition indicates that the lingual flange rests upon muscle fibers unless its border falls short of the mylohyoid line.

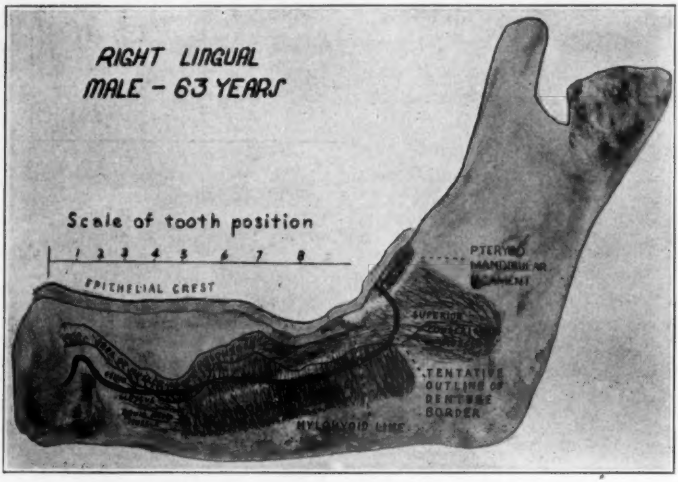

Fig. 10.—Right lingual surface of mandible with denture-supporting structures as correlated from microscopic study from serial sections of lower jaw.

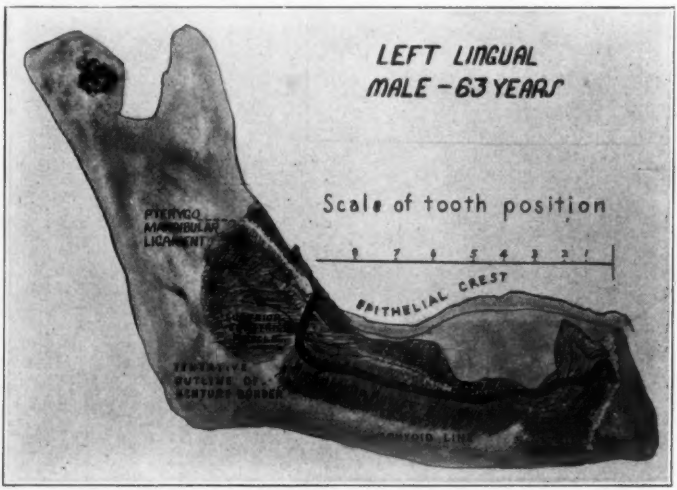
LEFT LINGUAL
MALE - 63 YEARS
Scale of tooth position
8 7 6 5 4 3 2 1
EPITHELIAL CREST
PTERYGO MANDIBULAR LIGAMENT
TENTATIVE OUTLINE OF DENTURE BORDER

Fig. 11.—Correlation of left lingual muscles according to measurements taken with aid of microscope in relation to tentative outline of border of prosthetic denture.

The adaptation of the base of the artificial denture is complicated by: (1) resorption of the mandible, which tends to reduce the area to which the muscles are attached; (2) the character of the muscle attachment, and (3) the action of the tongue and the tone of the tissues supporting the prosthetic denture. In the molar area, these factors assume considerable magnitude since the action of the structures must not be impeded by the prosthesis.

The musculature of edentulous jaws presents adaptive changes compensating

for alterations in the form of the bone. It has been observed that the character of muscle attachments depends on the area and form of the surface from which the muscle fibers arise. The greater the change resulting from resorption, the more certain it is that the muscle will a distinct influence upon the elasticity of associated tissues. In the molar area, where the tissues at the lingual surface of the mandible are deep, their action is affected by the muscles of the floor of the mouth and those of the pharynx. When the deep structures are influenced by

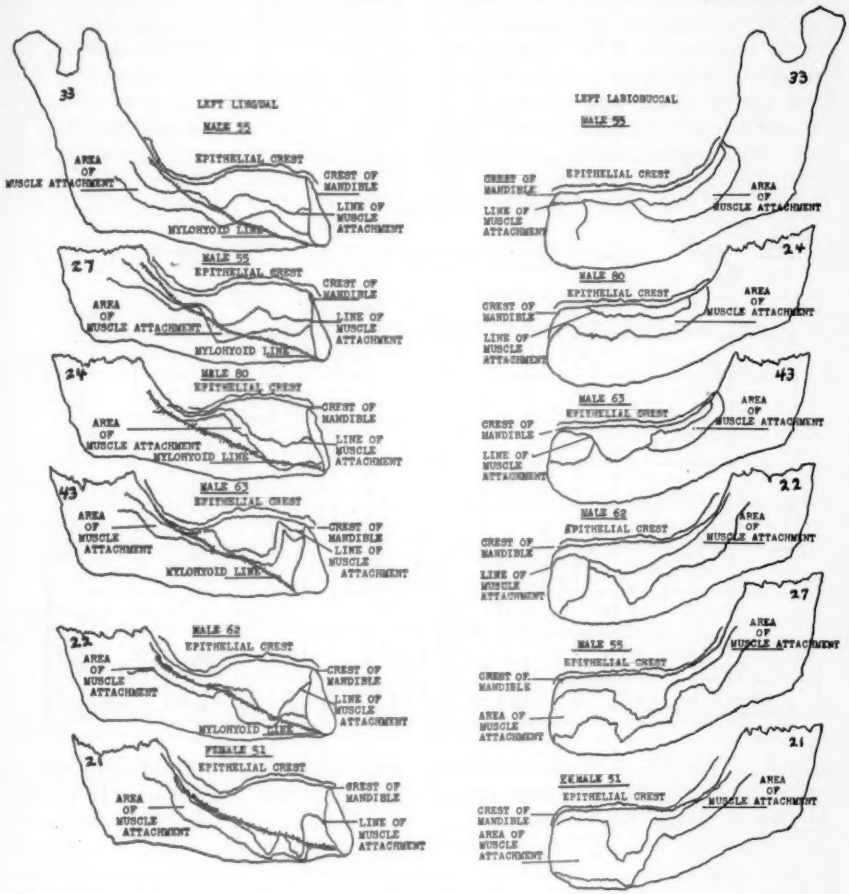

Fig. 12.—Drawings illustrate variability of musculature from six representative cases recorded in Tables 1 and 2.

be found to have aponeurotic or tendonous attachments. In mandibles presenting well-formed residual ridges, the muscle fibers are attached to the periosteum.[7] The character of muscle attachments has muscles having collagenous attachment, much of their native elasticity is lost. The problem of establishing the design of the denture becomes increasingly difficult when the amount of free fat in the

tissues is diminished because of debilitating disease and ill health.

In the molar region, the muscle fibers lying in a horizontal plane above the mylohyoid line are invariably attached to the periosteum. Unlike the mylohyoid muscle, which lies in a vertical plane, these fibers usually appear as a ribbon-like structure and are not massive. They are the attachments of the superior constrictor of the pharynx and in some jaws cover 6 mm. of the bone surface above the mylohyoid line. This would mean that at least one-half of the area between the crest of the ridge epithelium and the mylohyoid line of the mandible affords attachment to the muscle. In the prosthetic treatment of such cases, the musculature must be considered as a denture supporting structure, unless the border of its lingual flange fails to cover the area available for support. Mechanical irritation, resulting in an intolerable condition, follows the construction of the border of a lingual flange that terminates at the attachment of muscle fibers. If the denture is to be worn with satisfaction by the patient, its border should extend beyond the area of muscle attachment and upon the movable portion of the structures that contain fat, glands and loose connective tissue. (Fig. 1.)

The buccinator muscle is intimately associated with the buccal rim of the prosthesis. It presents unusual potentialities in the edentulous state as it rarely has attachments to the mandible, except in the postmolar area, where it is covered by glands, fat and loose connective tissue. These attachments like those of the superior constrictor of the pharynx, appear as a thin ribbon-like structure attached to the periosteum. It is noteworthy that the bulk of fibers composing the buccinator are cushioned with richly vascular fat-contained connective tissue. The buccinator fibers continue forward from the pterygomandibular raphe and the postmolar area of the mandible to the angle of the mouth. They occupy much of the buccal area superior to the external oblique line, with some fibers extending near the mandibular ridge forming a contractile structure highly

TABLE 1.

A

Table of composite measurements in mm. of the area covered by the labiobuccal and lingual muscles of nine edentulous jaws

Jaw \ Tooth position	LINGUAL SURFACE									LABIOBUCCAL SURFACE							
	24	25	33	22	4	23	27	21	43L	27	24	25	33	22	21	4	23	43
1	10	5	4	15								3/1	4	15	15			12
2	9	5	3	1							10	3/E2	4	3	15			10
3	9	7	2	2						12	9	19		5	19			14
4	3	1½/M 4		6	7	4	8	4	3		6	3/E		12	10	4	11	14
5	1½	M 1/3	8	11	M 4/2	5	5	3	3	4					7	10/E	13	5
6	1½	M 2/5	7	M 1/-	M 4/2	M 3/2	6	M 4/1	M 4/2	5	E 7	E 2		E 5	E 6	E 10	8	E 5/2
7		M 1/3	6	M 4/-	M 4/2½	M 3/2	M 1½	M 3/1	M 4/-	4		E 5	E 8		E 8	E 12	E 4	E 7½
8		M 3/3	M 5/1	M 3/-	M 4/3	M 3	M 2	M 4/1	M 4/-	4		E 6	E 8	E 10	E 8	E 15	E 4	E 7
Post-Molar			M 5/1			M 3	M 1/1	M 4/1	M 4½/1	E 10		E 9	E 8	E 9	E 10		E 10	E 6

susceptible to mechanical influences. (Fig. 2.)

Composite measurements shown in Table 1 indicate that the average surface covered by the buccinator muscle, above the external oblique line, is 5 mm. in the first molar area, 6 mm. in the second molar area, 7 mm. in the third molar area and 8 mm. in the postmolar area. The surface covered by the buccinator muscle in a man aged 38 years (Jaw 4, Table 3) is 10 mm. in the first molar (x) and 15 mm. in the third molar (xx) area. These measurements show the maximum surface available for denture support; whereas, in a man aged 63 years, the variation is 3 to 7.5 mm. (Table 4), which represents the minimum surface at the residual ridge where muscle fibers directly affect the denture base.

TABLE 2.

B — Table of composite measurements in mm. from the epithelial crest to the labiobuccal and lingual muscle attachments of nine edentulous jaws

	LINGUAL SURFACE									LABIOBUCCAL SURFACE								
Tooth position / Jaw	43	24	25	33	22	21	4	23	27	43	24	25	33	22	21	4	23	27
1	6	12	9	15	10	13				3	0	4½	5	5	4			
2*	3	18	16	15	16	13				3	0	4½	4	7	5			
3	17	16	15		23	30*			12	4	6	5		9	6			7
4	14	15	6		18	20	15	12	10	2	6	9		13	21		2	15
5	15		6	9	12	27	7	10	14	2		7	5		17	4	4	17
6	4	2†	5	12	9	14	4	5	14	0	6	6	4		4	6	3	15
7	4		5	5	5	8	7	7	3	3		5	6	5	4	3	6	4
8	3		6	5	4	8	4	5	4	3		5	6	5	3	4	6	4
Post-Molar	3		7	9	4	5		6	7	3			5	4	3	4	6	10

Identification of the individual muscles at the lingual surface of the mandible may not be considered infallible in histologic sections. This is particularly true at the posterior part of the mandible. However, when a field is limited by attachments of the masseter muscle at the external surface, it seems relatively certain that the lingual structures may be regarded as within the postmolar area. The mylohyoid muscle usually appears to extend its attachments to a position near the posterior extremity of the mylohyoid line. (Fig. 3.) The superior constrictor of the pharynx rarely has attachments to the bone in this field. Still, in some cases, it also may have attachments in the postmolar area.

The structures of the postmolar area constitute an elastic cushion composed of fat-contained connective tissue and glands. The mesial portion of this cushion expands from the dense fibrous connective tissue covering the residual ridge. The buccal portion is penetrated by the fibers of the buccinator muscle extending over the external oblique line and well toward the epithelial crest. The lingual and deepest area of the cushion is supported by the vertical fibers of the mylohyoid muscle and the oblique fibers

MUSCLES OF THE POSTMOLAR AREA

In 1922, Bowen stressed the significance of the postmolar area as a means of securing the retention of mandibular dentures.[8] Neil collaborated in this study and, through his work, has influenced the present concept of the relationship of the anatomic structures to the prosthetic problem.[9]

of the superior constrictor which extend upward and backward to the pterygomandibular ligament and the internal pterygoid plate. It may be said to influence the distal extremity of the mandibular denture. (Fig. 4.)

MUSCLES OF THE MENTAL AREA

Renewed interest prevails in the part played by the labial and especially the anterior portion of the lingual borders of the denture in the scheme of retention and stability. A study of the characteristics of the denture-supporting structures in the anterior part of the mandibular arch discloses individual conditions that may be considered highly unfavorable to the successful treatment of the edentulous. From the symphysis to the cuspid area, where the buccal surface begins, distinctive structural conditions, unlike other areas of the lower jaw, exist. The mentalis muscle is, in many edentulous cases, one of the strongest of all the labiobuccal mandibular muscles intimately associated with the denture area. It is usually attached by aponeurosis, near the crest of the ridge, at the labial surface of the mandible. Table 6 (p*) shows the only case studied in which the mentalis muscle had exclusive periosteal attachments. The muscle was attached by aponeurosis where the ridge was affected by resorption, and resorption commonly prevails throughout edentulous jaws. Aponeurotic attachments complicate the problem of developing the form of the denture border. The difficulties encountered in establishing a satisfactory contour of the prosthetic denture are magnified by the extreme contractile powers of the mentalis muscle and its bulk and the presence of collagenous fibers.

The genioglossus muscles at the lingual surface near the symphysis appear to be attached by aponeurotic fibers. The geniohyoid muscles are usually attached to the periosteum of the mandible directly below the genioglossus. The dense, irregular surface of the bone giving rise to these muscles presents a natural obstacle to the development of adequate retention and interferes with establishing stability of the artificial denture. Likewise, the form and action of the tongue tend to make the process of adapting the anterior lingual border intricate and often unsatisfactory. The complexity of the prosthetic problem is exaggerated by protracted resorption. (Fig. 5.)

The mental foramen has been referred

TABLE 3.

C

Jaw A
Age 38
Sex male

	Natural tooth space	Depth of ridge summit to ma.	LINGUAL: Distance from epithelial crest to muscle attachment	Area covered by muscle attachment	Attachment by aponeurosis	Attachment to periosteum	LABIO-BUCCAL: Distance from epithelial crest to muscle attachment	Area covered by muscle attachment	Attachment to bone
3 R	½	12	5	a	p	4	4		no
4 R	½	7	M 5/3	a	p	4	3		no
4 L	1	15	7	a	p	4	4		no
5 R	1	4	M 4/1	a	p	4	E 10		no
5 L	½	7	M 4/3	a	p	6	E 10		no
6 L	½	4	M 4/2	a	p	3	X E 10		no
7 L	1	7	M 4/2½		p	4	E 12		no
8 L	1	4	M 4/3		p	4	XX E 15		no

R- right
L- left
M- mylohyoid line
E- external oblique line
a- aponeurosis
p- periosteum

to as an important mandibular landmark. The muscles of both the cheek and the floor of the mouth have their lowest attachments in this region. It seems rather striking that the vertical plane of the muscle attachments at the exernal and internal surfaces of the bone is comparable from the mental foramen forward to the vicinity of the area formerly occupied by the incisor teeth. (Fig. 6.) However, measurements exhibited in Table 2 indicate that the distance from the epithelial crest of the mandible to the muscle attachments may vary from 3 to 18 mm. At the lingual and at the labial surface, similar discrepancies are noted. Moreover, irregularities are demonstrated on the two sides of the same jaw in Tables 3 and 4.

Extreme variations in the area covered by the lingual and labial muscles are tabulated in Table 1. The picture illustrated by these measurements gives a tangible idea of the bulk of the mentalis muscles and may also suggest their potential strength.

COMPARISONS IN HUMAN TISSUES

In the several jaws, the area affording support, free from muscle attachments, varies from 2 mm. in the first molar area (2†) to 30 mm. in the cuspid area (30*) at the lingual surface of the mandible. (Table 2.)

The material studied has been secured predominantly from male subjects. However, Table 5 furnishes the opportunity to analyze measurements obtained from the jaw of a woman. The same general conditions common to male subjects ap-

TABLE 4.

D

Jaw 43
Sex Male
Age 63

	Natural tooth space	Depth of ridge mucosa in mm.	LINGUAL: Distance from epithelial crest to muscle attachment	Area covered by muscle attachment	Attachment by aponeurosis	Attachment to periosteum	LABIO-BUCCAL: Distance from epithelial crest to muscle attachment	Area covered by muscle attachment	Attachment to bone
1 right	2	6	3	a		2	12	a	
1 left	2	6	3	a		3	12	no	
2 right	2					2	10	a	
2 left	2	3	3	a		3	10	no	
3 right	2	12	4		p		8	no	
3 left	2	17	4	a	p	M 4/14	14	no	
4 right	1½	14	3		p	E 14	14	no	
4 left	3	14	3	a	p	E 2/12	14	no	
5 right	2	7	3	a		C	3	no	
5 left	2	15	1	a		C	5	no	
6 right	1½	4	M 4/2	a	p	5/E	3/E	no	
6 left	1	4	5	a	p	5/E	5/E	no	
7 right	1½	5	4	a	p	5/E	5/E	no	
7 left	1½	4	M 2/2	a	p	5/E	7½/E	no	
8 right	1½	4	4	a	p	5/E	4/E	no	
8 left	1	3	2		p	3/E	7/E	no	
Post-molar 1 left	1	3	4½	a	p	5/E	6/E	no	
2 left	1	4	M 4½/1		p	5/E	6/E	no	
3 left	1½	4	M 4/1		p	5/E	6/E	no	

M- mylohyoid line
E- external oblique line
C- cheek muscle
a- aponeurotic muscle attachment
p- periosteal muscle attachment

pear in the study of the histologic sections from the female. The deep muscle attachments are found in the cuspid (30*) and bicuspid areas (20*) and the shallowest structures are found in the postmolar area (5*). Fat-contained connective tissues surround the muscle fibers. However, even in the molar area, it can hardly be said that fat exists in greater abundance than in the male. (Fig. 7.)

DENTURE DESIGN

In anticipating the area of extension for support of the prosthetic denture provided by low muscle attachments, the barrier of fat-contained connective tissues, both superior and inferior to the musculature, should be recognized. At the lingual surface of the mandible, in the floor of the mouth, the sublingual glands offer an added obstacle to the extension of the denture base.

If the characteristics of the musculature influence denture design, they likewise preclude all possibility of contouring the prosthesis according to a standard pattern. Individuality of the muscle attachments, their movements as affected by the investing tissues and habits acquired by the individual constitute a cycle of conditions making of each case a distinct or separate problem. (Fig. 12.)

CONCLUSIONS

A study of the musculature of the edentulous lower jaw reveals evidence that the extended area forming the seat of attachment of muscle fibers serves in the support of the prosthetic denture.

It appears evident that the musculature, a dominant factor in the design of the prosthetic denture, likewise is a contributing element in the elasticity of the tissue. Tissue elasticity embraces many phases of the biologic question. However, elasticity of the denture-supporting tissues is imperative for equilibrium and retention of the artificial denture.

The contractile fibers of the muscles constitute a movable foundation for the maintenance of the complete artificial denture. The denture borders are intimately associated with muscle fibers at the labial aspect, from the midline of the mandible to the cuspid area and from the molar area posteriorly to the buccal extremity at the external oblique line. At the lingual surface of the mandible, the denture borders are similarly

TABLE 5.

E

Jaw 21
Sex female
Age 51

	Natural tooth space	Depth of ridge mucosa in mm.	LINGUAL: Distance from epithelial crest to muscle attachment	Area covered by muscle attachment	Attachment to aponeurosis	Attachment to periosteum	LABIO-BUCCAL: Distance from epithelial crest to muscle attachment	Area covered by muscle	Attachment to bone
1	1	13	10	a	p	4	15		p
2	1	13	10		p	5	15		p
3	1½	30*	2		p	6*	19		p
4	2	20*	4		p	21*	10		p
5	1½	27*	3		p	17*	7		p
6	1	14	M 4 / I T	a	p	4	E-- 6		no
7	1	8	M 3 / I T	a	p	4	E-- 8		no
8	3	8	M 4 / I T	a	p	3	E-- 8		no
Post molar	4	5*	M 4 / I T	a	p	3*	E--- 10		no

affected. In edentulous lower jaws, the mylohyoid line invariably assumes extreme prominence in the molar region. Bone changes contribute to variations in the character of the muscles and the quality of the adjacent soft tissues.

Two muscles with attachments of unlike quality arise in the molar region. The mylohyoid muscle usually has aponeurotic attachments, while the superior constrictor of the pharynx arises from the periosteum. The attachments of the superior constrictor muscle are usually confined to the molar region and are extremity of the lingual flange of the artificial denture must be congenial to these delicate structures.

The buccinator muscle, recognized as the principal muscle of the cheek, has the distinction of being, apparently, a true cheek muscle in most edentulous conditions. Its only attachment to the bone seems to be in the postmolar region. This finding is significant to the outline of the denture rim, which is supported by buccinator fibers extending well above the external oblique line toward the crest of the mandibular

TABLE 6.

F

Jaw 25 —
Sex —
Age —

	Natural tooth space	Depth of ridge mucosa in mm.	LINGUAL: Distance from epithelial crest to muscle attachment		Area covered by muscle attachment	Attachment by aponeurosis	Attachment to periosteum	LABIO-BUCCAL: Distance from epithelial crest to muscle attachment	Area covered by muscle	Attachment to bone
1	1	9	5			p*	4½	4		a-p
2	1½	16	5			p*	4½	5		a-p
3	2	15	7			p	5	19		p
4	2	6	M 1½/4		a	p	9	3		p
5	2	6	M 1/2			p	7	-0		no
6	2	5	M 2/5		a	p	6	E 2		p
7	1½	5	M 1/1		a	p	5	E 5		no
8	2	6	M 1/3		a	p	5	E 6		no
Post-Molar	3½	7	M 3/2			p	-0	E 9		no

M- mylohyoid line
E- external oblique line

a- aponeurosis
p- periosteum

located above the mylohyoid line, while the mylohyoid muscle has attachments at the mylohyoid line throughout its extent in the postmolar area.

The fibers of the mylohyoid muscle extend from their attachment in a vertical direction. The superior constrictor muscle extends obliquely backward and upward with its fibers superiorly and superficially from those of the mylohyoid muscle. The deep structures at the lingual surface of the mandible, approximating the anterior wall of the pharynx, are affected by coordinated action of these muscles. Moreover, the posterior ridge. The form, extent and contour of the denture borders are critically affected by irregularities in the surface contour of the bone.

The variability of the soft tissues precludes the development of a standard pattern in designing the outline form of the artificial denture.

SUMMARY

Serial histologic sections of the edentulous human jaw were prepared and the location of each section was calculated according to certain anatomic landmarks and a scale of the natural teeth.

A series of measurements in millimeters was taken of the structures intimately associated with the denture-bearing region. These structures were correlated according to scale on photographs of the edentulous human mandible and related to an outline of the tentative border of the prosthetic denture. The Tables record the measurements of nine jaws.

Variations in the quality and position of the muscle attachments and in the area which they cover are characteristic of the structures. Changes in the edentulous jaw are generally attributed to the processes of resorption.

The dense fibrous connective tissue of the mucosa at the ridge of the mandible displays little variation in quality and depth except in the postmolar region, where the mucous glands form a submucosa that is quite thick. There is little doubt that the muscles intimately associated with the areas of denture support are the dominant factor in the extent, form and contour of the prosthetic denture. Its labiobuccal design is determined, principally, by the mentalis and buccinator muscles. The muscles likewise form a movable support for the anterior and posterior extremities of the labiobuccal rim of the artificial denture. The mentalis muscle is strong and is usually attached by aponeurotic fibers near the residual ridge. The buccinator, it seems, must be characterized as a cheek muscle in edentulous jaws. It covers much of the buccal area of the mandible between the ridge and external oblique line in the molar area and is supported by a richly vascular fat substance. Its bony attachment is at the crest of the ridge in the postmolar area. (Figs. 8 and 9.)

The muscles of the floor of the mouth offer greater complexities in the denture problem than those at the external surface of the mandible. A striking resemblance exists in denture outline at the anterior and posterior extremities of both lingual and labiobuccal surfaces of the lower jaw. This similarity is due largely to the quality and position of the muscle attachments, which are invariably strengthened by collagenous fibers at the lingual surfaces of the mandible. The outline of the border of the prosthetic denture must extend beyond the attachment of the supporting muscles. It should extend upon the fat-invested fibers of the muscles and connective tissues that provide an elastic cushion contributing to retention and stability. (Figs. 10 and 11.)

BIBLIOGRAPHY

1. WILSON, G. H.: Dental Prosthetics. Philadelphia: Lea and Febiger, 1920, p. 330.

2. *Ibid:* Pp. 31, 64, 105.

3. HERBERT, S. C.: Treatise on Operations of Surgical and Mechanical Dentistry. Philadelphia: Barrett and Jones, 1847, p. 162.

4. WHITE, H. M.: Artificial Dentures. *D. Cosmos,* 3:4-6, January 1862.

5. MACMILLAN, H. W.: Anatomy of Throat, Mylohyoid Region and Mandible in Relation to Retention of Mandibular Artificial Dentures. J.A.D.A., 23:1435, August 1936.

6. FISH, E. W.: Principles of Full Denture Prosthesis. London: John Bale, Sons and Danielsson, 1933, p. 74.

7. PENDLETON, E. C.: Influence of Biologic Factors in Retention of Artificial Dentures. J.A.D.A., 23:1233, July 1936.

8. BOWEN, B. K.: Lower Denture Construction with Especial Reference to Retention. *D. Summary,* 42:847, October 1922.

9. NEIL, EWELL: Full Denture Practice. Nashville: Marshall and Brice Co., 1932, pp. 38-51.

PULP MANAGEMENT IN FRACTURES OF YOUNG PERMANENT TEETH

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THE increasing frequency of fractures of the young permanent anterior teeth has made their successful management a matter of vital concern to the general practitioner. Many of these accidents result in exposure or near exposure of the pulp tissues. The restorative aspect of such cases is usually less of a problem than is the care of the pulp.

This discussion is primarily intended to clarify the objectives to be sought and to point a way of attaining these objectives when fractures of the young permanent teeth result in pulp involvement. The primary objective is maintenance of pulp vitality to permit continued root formation. A fully formed root and a vital pulp will later permit an esthetic and functional restoration.

In the management of exposed pulps, three methods are commonly employed, including complete pulp removal, pulp capping and pulpotomy. When the apical foramen is incomplete, the usual method of pulp removal followed by root-canal filling is contraindicated. The funnel-shaped apex of the partially formed root, which can never be perfectly sealed, invites periapical involvement. Pulp capping, while widely practiced, is not very likely to be successful. Every pulp exposed by fracture is, at least, a superficially infected pulp. It is clear that the existence of infection imposes a severe handicap on any reparative power which the tissue may possess.

Pulpotomy overcomes the chief objections raised to the two previously mentioned procedures. First, the aseptic removal of the coronal portion of the pulp may eliminate the originally infected tissue. Thus, the principal objection to pulp capping is eliminated. Second, the necessity for sealing an open apical foramen with foreign material is obviated by maintaining the vital tissue in the canal by means of a surgically clean wound at the junction of the coronal and root portions. Pulpotomy, therefore, seems to be the method of choice as far as the management of the pulp is concerned in fractures of young permanent teeth.

Pulpotomy, which consists of the removal of the coronal portion of the pulp, may be accomplished in either of two ways. One method consists of rotating a large round bur in the pulp chamber, which tears the bulbous portion of the pulp loose from the root portion and leaves a lacerated wound surface over the root portion. Such a procedure probably delays the healing process more than does a clean cut wound. The primary objective of a pulpotomy is to maintain the vitality of the root portions of the pulp. To accomplish this end, it is suggested that the amputation be effected by a second method, consisting of removal of the bulbous portion of the pulp by means of sharp spoons or knives.

For the dressing of the clean-cut wound surface, various drugs are employed. McBride[1] advocates the use of phenol followed by hydrogen peroxide and cauterization by means of a heated instrument. Hogeboom[2] uses zinc oxide and formocresol. Brauer[3] advocates zinc oxide and eugenol.

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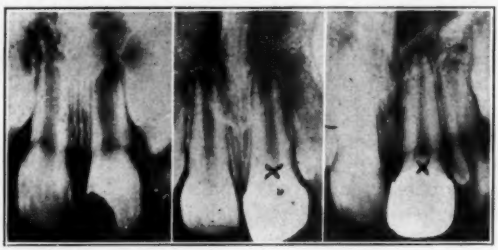
The use of such powerful antiseptic drugs in treating a wound surface is not in accordance with the methods accepted in general surgery. In a preliminary report on pulpotomy, Teuscher and one of us (H. A. Z.)[4] described the use of calcium hydroxide as a mild antiseptic and wound dressing favorable to healing. Later, a report was made on the reaction of the pulp to calcium hydroxide.[5] It was observed that the pulp lays down an amorphous calcified layer or bridge across the cut surface of the pulp tissue in contact with the drug. The creation of the new layer of well calcified dentin-like substance over the exposed surface of the pulp represents the most nearly ideal reparation that could reasonably be expected. The bridging over of the cut surface of the pulp by activity of the odontoblastic cells can be compared to the similar action of the epithelial cells in restoring the continuity of the skin after an incision or accidental wound. The same results can be obtained by the same method in cases of fractured teeth.

Certainly no more nearly ideal repair for a pulp exposed by the fracture of an incisor could be desired than to have the tissue itself build a natural calcific barrier. It is for this reason that the method of pulpotomy described by Teuscher and one of us (H. A. Z.) has been tried in a selected group of cases of fractured anterior teeth.

Figure 1 A shows the fractured incisor tooth of a boy aged 8 years. The break involved the mesial angle, exposing the pulp tissue. The apical foramen is open, being incompletely formed. Three days after the fracture, pulpotomy was performed by the method of choice as outlined in this paper.

Figure 1 B shows the same tooth ten months later, with root formation apparently proceeding normally as compared with that of the other incisor. A calcified layer of the same density as dentin can be seen at X, at the site of pulp amputation.

Figure 1 C shows the same tooth two and a half years after pulpotomy. The root end is almost complete and no apical disease is evident. The bridge of the dentin-like material is more clearly seen in this later roentgenogram.



A B C

Fig. 1.—Roentgenograms of upper incisor of boy 8 years of age. A, appearance immediately after injury. The mesial corner is fractured, with exposure of the pulp. The apex of the root is wide open. B, same tooth ten months after pulpotomy. Continuation of the root formation can be observed. C, same tooth two and one half years after pulpotomy. At X, a bridge of dentin covers the site of amputation. The root formation is almost complete.

In order to supplement the roentgenographic findings, and to show the nature of the bridge at the site of pulpotomy, another fractured incisor was extracted eight months after pulpotomy. (Fig. 2.) At A, a bridge of dentin covers the entire wound surface at the site of amputation. The pulp tissue has a normal appearance, with the exception of a chronic inflammatory region close to the bridge, which may be concerned with the process

of repair still going on in this region. The crown of the tooth is reconstructed in the figure to show the original outline of the pulp, and how much had been surgically removed. (Fig. 2.) B indicates the line of the original fracture. After eight months, this tooth was broken again, and was then extracted and this specimen obtained.

Figure 3 is a high power magnification of the dentin bridge, A, in Figure 2. The odontoblastic layer B can be clearly distinguished beneath the dentin of the root portion as well as beneath the newly formed dentin bridge. The dentinal tubules of the bridge are quite regular and well defined. The pulp tissue appears normal.

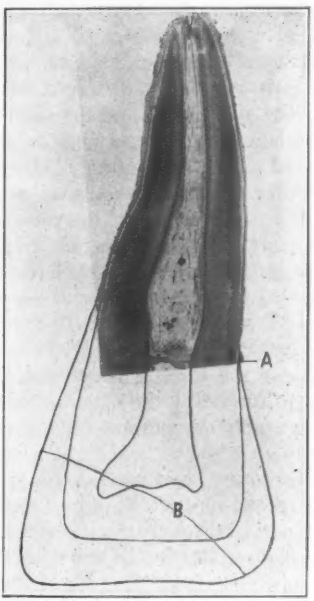


Fig. 2.—Photomicrograph of fractured incisor of boy 9 years of age, eight months after pulpotomy had been performed. A, dentin bridge at site of pulp amputation. B, original fracture.

Figures 1 to 3 illustrate that where the pulp of a young permanent tooth has been exposed by fracture, vitality can be successfully maintained and normal root formation be permitted to continue. These illustrations also demonstrate that the injured pulp, under these conditions, undergoes a healing process, with the formation of new dentin at the site of exposure.

Other investigators have described similar results in cases of this character, using different technics of pulpotomy. This report, however, also gives histologic evidence as to the exact nature of the calcification.

METHOD

Anesthesia is first obtained by local injection of procaine. The rubber dam is then applied and the field sterilized by application of 3 per cent tincture of iodine or 70 per cent alcohol. Free access to the pulp is essential. With large fissure burs, the roof of the pulp chamber is enlarged from the original point of exposure. Great care should be exercised to avoid tearing the pulp tissue at this time. Large spoons are then employed in an effort to loosen the bulbous portion of the pulp from the walls of the

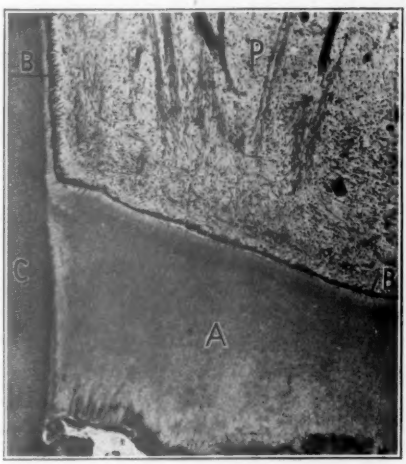


Fig. 3.—Higher magnification of dentin bridge A in Figure 2. B, odontoblasts. C, root dentin. P, pulp.

chamber. Once separated, the entire coronal tissue should be removed by means of a clean cut with a sharp spoon. Bleeding is controlled by application of sterile cotton pellets soaked in a saturated solution of calcium hydroxide or hydrogen peroxide. After the bleeding is controlled, a creamy paste of calcium hydroxide and distilled water is placed without pressure over the pulp stump. It is usually advisable to remove any excess water by touching a dry cotton pellet against the creamy paste after it has been applied.

The next step is to flow a thin layer or paraffin over the paste. The object of using the paraffin is to keep the acid in the zinc cement (which is to be next applied) from reacting with the alkaline calcium hydroxide. The remainder of the pulp chamber is then filled with cement, with avoidance of pressure.

The tooth is now ready for a permanent restoration. The usual procedure is to construct a modified three-quarter crown or slipper crown, which requires no tooth preparation and adequately protects the fractured area.

DISCUSSION

The success of the management of these cases depends on a careful diagnosis and strict adherence to the fundamental principles of the technic. The rubber dam should be in place and all instruments that come in contact with the pulp should be sterile. Unnecessary laceration and injury to the pulp should be avoided. Strong antiseptic drugs, such as phenol and silver nitrate, should not be used.

Correct diagnosis of fracture cases in which it is advisable to perform a pulpotomy is extremely important. The sooner such cases are seen after the accident, the better the chances for success. Degenerative changes in the coronal portion of the pulp may not necessarily contraindicate pulpotomy, provided healthy tissue exists in the canal. Clinical tests such as electric shock and application of heat and cold are not always indicative of the true condition of the pulp. The most practical method of ascertaining the possibilities for treatment in a doubtful case is to remove the coronal tissue and estimate the health of the root portion by inspection. Free bleeding, absence of odor and the general appearance of the tissue must be considered.

The object of pulpotomy, as previously stated, is to maintain the vitality of the root portion of the tooth and permit normal apical completion. Pulpotomy is superior to capping in the accomplishment of these ends because it involves the removal of the entire bulbous pulp tissue. An exposed pulp is an infected pulp, and if this tissue at the site of exposure is not removed, a greater burden is placed on the remaining healthy tissue in its efforts to survive and continue calcification. The fact that the root end is incomplete at the time of fracture, coupled with the embryonal character of the pulp, favors survival and calcification. Differentiation of the cells to undertake the task of building dentin is more feasible at this time. The generous blood supply afforded by the open apical foramen is another important factor. It can be seen that the presence of an incompleted foramen is actually an aid in performing a successful pulpotomy, although it is the very factor which has made the application of usual methods, such as root-canal filling, decidedly impractical and unsatisfactory in the past.

BIBLIOGRAPHY

1. McBRIDE, W. C.: Juvenile Dentistry. Philadelphia: Lea & Febiger, 1937, p. 277.

2. HOGEBOOM, F. E.: Practical Pedodontia. St. Louis: C. V. Mosby Co., 1938, pp. 235-237.

3. BRAUER, J. C.: Dentistry for Children. Philadelphia: P. Blakiston Son & Co., 1939, p. 181.

4. TEUSCHER, G. W., and ZANDER, H. A.: Preliminary Report on Pulpotomy. *N. U. Bull., D. Res. & Grad. Stud. Quart.*, December 5, 1938, p. 4-8.

5. ZANDER, H. A.: Reaction of Pulp to Calcium Hydroxide. *J. D. Res.*, 18:373-379, August 1939.

6. RESTARSKI, J. S.: Preserving Vitality of Pulps Exposed by Caries in Young Children. *Ill. D. J.*, 9:2-7, January 1940.

EFFECTIVE INTERDENTAL STIMULATION

By B. O. A. THOMAS, D.D.S., M.S., New York, N. Y.

THE majority of dentists will agree that patients with gingivitis do not cooperate very well as regards massaging the gums. This fact should lead us to conclude that our methods of obtaining the desired result are too complicated or time-consuming in the opinion of the majority of patients. Therefore, it is prudent for us as dentists to examine our methods of gingival massage to see whether we cannot attain our objective by simpler methods, which the average patient can probably employ effectively.

When the epithelial attachment surrounding the neck of the tooth is broken, bacteria may more easily penetrate the underlying connective tissue, gingivitis resulting. Subgingival calculi, by occupying space normally filled with gingival tissues, irritate the adjacent gingiva, with resultant inflammatory changes and vascular stagnation.[1] Thus is created an area of lowered resistance to which bacteria find easy access. As these conditions progress, the epithelial layer of the affected gingivae loses its hornified layer, becomes thinner and is not so resistant to trauma or bacterial invasion.[2]

The problem in the conditions just described is to restore the gingival tissues as nearly to the original condition as possible and to prevent progressive deepening of the pocket which is present, or formation of a pocket if the lesion is in its incipiency. This problem resolves itself into three parts: removal of the irritating agent; eradication of infection and inflammation, and stimulation of the epithelium to hornification of its superficial layers.

The first of these problems is solved by scaling and thorough oral prophylaxis. Such treatment may also be sufficient to assure the second desired result; or it may be necessary to employ certain drugs to eliminate the infection and inflammation. The third effect is achieved by massage of the gingivae. Any of several instruments may be used, in a variety of ways. It seems entirely logical that the simplest means by which the desired result (thickened, hornified epithelium, resting on connective tissue free from infection and inflammation) can be attained is most desirable.

INSTRUMENTS FOR MASSAGE

Included among the numerous instruments advised for gingival massage by the patient are the following:

The Fingers.—Because of their large size, the patient's fingers are chiefly beneficial in massaging the labial or buccal and lingual gingivae, exerting little effect interproximally. The toothbrush, as generally used, gives the same results.

The Toothbrush.—The number of variations in shape and size of this instrument is amazing.[3] The more intricate the design of the toothbrush, the less effective it becomes for the purposes it is intended to serve. H. W. C. Bodecker[4] says ". . . the toothbrush is not an implement with which to brush the teeth, but . . . is to be considered solely as a bundle of toothpicks, and . . . should be used as

From the Laboratory of Oral Histology, School of Dental and Oral Surgery, Columbia University.

such only." Without proper instructions in the use of the toothbrush, a large percentage of patients do serious damage to the teeth and periodontal tissues with the toothbrush.[5] Edmand[6] says, "A check-up on my patients over a period of twelve years reveals that about 10 per cent actually brush the teeth with an intent to stimulate the gingiva." When properly instructed in a method of brushing, many patients are able to restore the gingival tissues to a healthy condition. The interdental stimulation is the most difficult and least effective part of the toothbrush régime, no matter which method of brushing is taught.[7, 8]

The Rubber Pick.[9]—To accomplish interdental massage, certain toothbrushes have a tapered, flexible rubber pick attached to the handle. Usually, this rubber pick is too flexible or of too great diameter to function effectively in the interproximal areas.

The Rubber Brush.—This brush, which fits over the end of the finger like a finger cot, is not much more effective than the finger for massage of the buccal or labial and lingual tissues, and less effective interproximally than the regular toothbrush.

Dental Floss.—This material is effective only in removing débris from the immediate vicinity of the contact point and of no value in massaging the gingivae. In fact, considerable harm may result from the injudicious use of floss, to both the gingivae and the hard tissues of the teeth.

Patented Wood Stimulator.—This soft medicated wood instrument is remarkably effective for interdental tissue massage.[8] The wood is passed from the labial (or buccal) surfaces to the lingual surfaces between the contact point and the gingivae, with a push and pull movement. However, the disadvantages of this type of stimulator are that the wood becomes too soft and spongy after absorbing

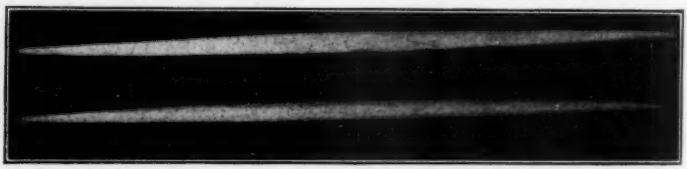


Fig. 1.—Round tapered polished wood toothpicks employed in interdental stimulation.

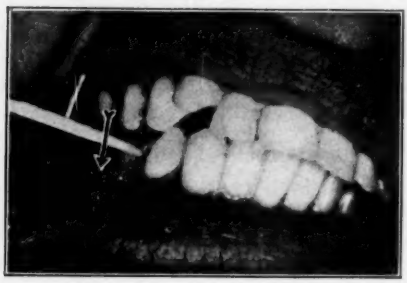


Fig. 2.—Toothpick in position for massaging interdental tissues of lower arch. The arrow indicates the direction of pressure for tissue stimulation.

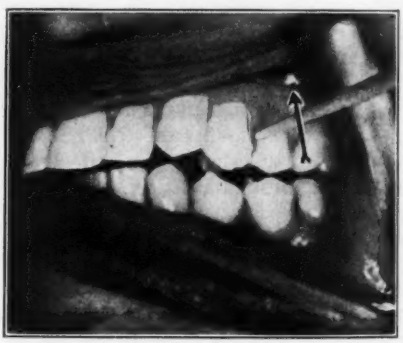


Fig. 3.—Toothpick in position for massaging interdental tissues of upper arch. The arrow indicates the direction of pressure for tissue stimulation.

saliva, this necessitating the use of several points in massaging all the interdental spaces; which makes the cost such that many patients cease to use the stimulators after a short time.

In the past several years, I have seen the following simple method prove itself most effective in massage of the interdental tissues. It is so inexpensive that no patient need ever discontinue its use for financial reasons. Polished wood toothpicks, round and tapering to a point at each end (Fig. 1) are employed. The wood is firm and only slightly absorbent.

The technic for using such a toothpick in stimulating the interdental tissues is simple, but must be strictly adhered to:

TECHNIC

Insert the end of the pick between the contact point and the gingivae on the buccal or labial surface. Push the tip lingually until the pick is rather firmly wedged in the interproximal space, but not until it is uncomfortable. Gently, but firmly, press the toothpick apically, maintaining constant pressure for a few seconds. (Fig. 2.) Repeat this four or five times, then remove the toothpick and pass on to the next interdental space, repeating the procedure. Do not move the toothpick back and forth in a labial to lingual direction over the gingivae, because such abrasive action will denude the gum of epithelium and cause more harm than good.

One end of a toothpick may be used to massage the interdental tissues of the upper arch and the opposite end for the lower arch. In order that patients may learn to massage the tissues between the posterior teeth effectively, it is essential to carry out this procedure before a mirror.

Edmand[6] has the following to say regarding this treatment:

In a case which came under my care a year ago, there was a discharge of pus together with hypertrophy of the gums extending beyond the contact point on the buccal-lingual and labial-lingual sides of the teeth. The alveolar process showed atrophy, with granulomatous tissue—a typical case of periodontoclasia. No particular kind of treatment was authorized at this time other than that the patient was instructed in the use of a round polished toothpick. . . . In less than one month this case was entirely normal and it has so remained.

Hubbell, in a large series of cases, claims similar favorable results.

It is interesting to note that Box[10] recommends the use of these toothpicks in the engine handpiece for polishing the proximal surfaces of the teeth.

For best results, interdental massage should be performed at least twice a day, with no periods of neglect, or gingivitis will rapidly return.[11]

This type of interproximal stimulation does not replace use of the toothbrush, but should be employed as an adjunct to brushing to attain a healthy condition of all the periodontal tissues.

BIBLIOGRAPHY

1. BODECKER, C. F., and APPLEBAUM, EDMUND: Clinical Importance of Gingival Crevice. *D. Cosmos*, 76:1127-1143, November 1934.

2. KRONFELD, RUDOLF: Histopathology of Teeth and Their Surrounding Structures. Ed. 2. Philadelphia: Lea & Febiger, 1939.

3. KAUFMAN, J. H.: Fifty-Seven Varieties of Toothbrush. *D. Digest*, 33:18-20, January 1927.

4. BODECKER, H. W. C.: Physiologically Clean Mouth. *D. Cosmos*, 68:425-434, May 1926.

5. HIRSCHFELD, ISADOR: Toothbrush—Use and Abuse. Brooklyn: Dental Items of Interest Publishing Co., 1939.

6. EDMAND, P. A.: Wood Applicators as Factor in Gingival Massage. *Am. D. Surgeon*, 49:358-359, August 1929.

7. BERTRAM, I. R.: Dental Prophylaxis (Home Care). *Bull. Colorado D. A.*, 12:3-12, March 1934.

8. LEGRO, A. L.: Interproximal Spaces. *D. Survey*, 10:53-55, September 1934.

9. GRACEY, C. H.: Home Care of Interproximal Spaces. J.A.D.A., 23:985-994, June 1936.

10. BOX, H. K.: Twelve Periodontal Studies. University of Toronto Press, 1940.

11. BODECKER, C. F.: Patient's Responsibility in Maintaining Clean Mouth. *D. Digest*, 34:615, September 1928.

A STUDY OF ZINC OXIDE-ROSIN CEMENTS
I. SOME VARIABLES WHICH AFFECT THE HARDENING TIME

By E. J. Molnar,* M.D., D.D.S., and E. W. Skinner,† Ph.D., Chicago, Ill.

ZINC oxide-eugenol cements have been used by dentists for the past sixty years. Most users of these cements have been enthusiastic concerning their value. However, some object to them because their hardening times are variable, oftentimes in a manner beyond the operator's control. The odor and taste of eugenol are also objectionable factors.

THE LITERATURE AND GENERAL CONSIDERATIONS

These cements mark a natural evolution from the zinc-oxychloride cement first announced by Sorel[1] in 1855. It was discovered that the latter could not be used for pulp capping because of the toxicity of the liquid employed, and a search was begun immediately for a less active liquid. Creosote was the first substitute used, by King,[2] according to his statements, but probably a similar material was employed independently by some of his contemporaries.[3] Later, the creosote was mixed with oil of cloves[4] and, in time, oil of cloves was used entirely.[5, 6, 7] The first proprietary eugenol cement (pulpol) was introduced in 1894 by Wessler,[8] in Sweden.

Studies have been carried on by Hentze[9] and by Ross[10] and others.[11, 12] Forster[13] attempted to prove that the hardening of the zinc oxide-eugenol cement is a physicomechanical process in which the structure of the zinc oxide remains unchanged. Howe[14] demonstrated the efficacy of silver nitrate as an accelerator for these cements, but it was not until the excellent paper by Wallace and Hansen[15] was written that this matter of the influence of constituent ingredients of the cement on hardening time was given systematic and scientific attention. This work was later extended by Paffenbarger and Caul[16] to include the influence of these ingredients on crushing strength, disintegration and solubility.

The work of Wallace and Hansen was limited to the investigation of two powder formulas and one liquid. The purpose of the present investigation is to study the effect of other ingredients on the hardening time and, to a limited extent, on the odor of the liquid.

There is little to be found in the literature regarding the nature and effect of accelerators of these cements. According to Wallace and Hansen, "Laboratory studies on proprietary and non-proprietary products . . . indicate that the setting time of the zinc oxide-rosin-eugenol mixture may be decreased by the addition of various metallic salts, such as zinc acetate and such substances as benzoic acid."

The importance of the accelerator aside from control of hardening time is suggested by the data in Table 1. It may be noted that the less the amount of

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accelerator (zinc acetate) used, the less the solubility and the greater the crushing strength. The reason for this may be that any zinc acetate in the hardened cement dissolves in the water, some acetic acid being produced by ionization. The acetic acid then possibly dissolves the zinc oxide, and the cement disintegrates readily. Such a condition suggests the search for an effective accelerator which is less soluble in the mouth fluids.

MATERIALS

The raw materials used for processing the cement were as follows: 1. Zinc oxide, C.P.* 2. Hydrogenated rosin. (Pine wood rosin treated with hydrogen under pressure in the presence of a catalyzer. The resin so produced is more stable chemically than rosin, particularly to oxidation and the effect of ultraviolet light.) 3. Accelerator, either reagent or C.P. materials. 4. Eugenol, U.S.P. XI. 5. Oil of bay, N.F. VI. 6. Guaiacol, U.S.P. XI.

*Staybelite, Hercules Powder Co.

METHODS OF COMPOUNDING AND TESTING ZINC OXIDE-EUGENOL CEMENTS

The difficulty of mixing powders containing a sticky substance such as rosin is well known in industry. In the present investigation, a pebble mill was found adequate, although very slow, for the control of particle size and homogeneity.

In order to produce numerous samples under as nearly uniform conditions as possible, the following method was used:

1. The rosin was ground in a porcelain mortar and pestle and sieved through a standard 60-mesh wire screen.

2. The sieved rosin was then mixed with a proportionate amount of zinc oxide in a mortar and pestle for ten minutes.

3. The mixture was placed in a half-gallon pebble mill jar with one-half inch porcelain balls the weight of which was twice that of the zinc oxide-rosin compound. The mixture was then ball-milled for thirty minutes at 60 revolutions per minute.

4. The material was scraped from the jar and sieved through an 80-mesh standard sieve.

5. Step 3 was repeated.

6. The mixture was sieved through a 100-mesh standard sieve.

7. Step 3 was repeated.

8. The material was sieved through a 200-mesh standard sieve.

The liquid generally employed for this type of cement was eugenol, but, in addition, oil of bay and guaiacol were

TABLE I.—SOLUBILITY AND COMPRESSIVE STRENGTH OF ZINC OXIDE-ROSIN-EUGENOL CEMENT*

Formula No.	Percentage Zinc Acetate by Weight	Solubility in Seven Days Per Cent	Compressive Strength After Seven Days (Lb. / Sq. In.)
II	0.7	0.1	2,000
III	0.35	0.02	5,500

*From Paffenbarger and Caul's Table 4.

TABLE 2.—HARDENING TIME WITHOUT ACCELERATORS

Powder	Hardening Time with Liquid			Powder:Liquid Ratio
	Eugenol	Oil of Bay	Guaiacol	
A	2-3 days	>1 day	2-3 days	1 gm./0.15 ml.*
B	2-3 days	>1 day	>1 day	1 gm./0.15 ml.*
C	5 hours	3 hours	4 hours	1 gm./0.15 ml.*

*Approximately 0.15 cc.

used. The oil of bay, containing 50-60 per cent phenol, was found to be effective after many experiments with various essential oils. Guaiacol was selected for use on the basis that it is a derivative of creosote. Neither of these liquids exhibit as generally objectionable a taste and odor as do eugenol and creosote.

For the actual mixing of the powder with the liquid, the usual cement mixing slab and a stainless steel spatula were employed. The slab temperature was kept nearly constant at the arbitrary temperature of 78° F. (25.5° C.). The powder:liquid ratio used was 1 gm./0.15 ml. unless otherwise stated. The mix was spatulated for one minute, one quarter of the powder being introduced into the liquid every fifteen seconds. An additional five seconds was allowed for gathering the cement together into a mass when a ring was not used. One third of the slab surface was used for mixing.

The instrument used for obtaining the hardening time was a standard 1-pound Gillmore needle. The material was considered hardened if no impression observable with a magnifying glass could be made by the weight of the Gillmore needle impressed for five seconds. Generally, if the hardening time was longer than one hour the results were considered negative. Xylene and toluene were used to dissolve the cement from the slab and the spatula.

SEARCH FOR AN ACCELERATOR

Zinc oxide-rosin-eugenol mixture alone requires two or three days to harden. Substances known as accelerators are added in order to shorten the hardening period.

Inasmuch as the present problem seemingly exhibited certain analogies to the drying of paints, some suggestions from this industry as to paint dryers[17] were adapted to these cements, but without success, as shown in Table 2. Powder A was zinc oxide, 70 per cent, and rosin (hydrogenated), 30 per cent by weight. Powder B was a zinc oxide-zinc resinate (70-30 per cent) mixture, and powder C was zinc oxide-manganese resinate, 70-30 per cent. As may be noted, powder C was a distinct improvement over powder A, but the need of an adequate accelerator for all the combinations is evident.

However, manganese dioxide was

TABLE 3.—EFFECT OF DIFFERENT ACETATE ACCELERATORS

Accelerator	Hardening Time		Solubility of Accelerator Gm./100 Ml.
	Eugenol	Oil of Bay	
Ag $C_2H_3O_2$	4 minutes	3 minutes	0.72-1.02
Na $C_2H_3O_2$	6-7 minutes	4 minutes	76.2
Zn $C_2H_3O_2$	5-6 minutes	6-8 minutes	31.1
UO_2 $C_2H_3O_2$	6 minutes	12 minutes	7.69
Pb (neutral) $C_2H_3O_2$	9 minutes	11-12 minutes	45.61
Pb (basic) $C_2H_3O_2$	17-18 minutes	13-14 minutes	v.s.*
Co $C_2H_3O_2$	2.5 hours	2 hours	s.
Mn $C_2H_3O_2$	3.5 hours	2 hours	s.
Ferrous $C_2H_3O_2$	3 hours	2.5 hours	v.s.
Cu $C_2H_3O_2$	3 hours	2.5 hours	7.2
Ferric (basic) $C_2H_3O_2$	5.5 hours	3.5 hours	insol.
Mg $C_2H_3O_2$	6 hours	4 hours	36.2
Ca $C_2H_3O_2$	12 hours	10 hours	37.4
Al (basic) $C_2H_3O_2$	12 hours	10 hours	s.
Ba $C_2H_3O_2$	15 hours	14 hours	76.4

*v.s. very soluble; s., soluble.

found to be without accelerating effect, as was silver oxide. Boric acid anhydride was also without effect.

Inasmuch as acetic and benzoic acids were known accelerators, the following related organic acids were tested for accelerating action, but with negative results: tannic, gallic, isobutyric, oxalic, maleic, tartaric, citric and uric acids.

Inasmuch as zinc acetate was known to be an excellent accelerator, other acetates were tried. The salts were selected from each group of the periodic table as far as was practicable, with particular attention to low solubility. Table 3 shows the results, arranged in increasing hardening time. In all cases, a zinc oxide-rosin powder (70-30) was used with an accelerator, 0.05 per cent by weight, incorporated in the powder.

As may be noted, other elements than zinc in Group II of the periodic table (magnesium, calcium, barium) were not effective as accelerators when used as acetates. Sodium and silver acetates (Group I) are both good accelerators, but copper acetate is poor. In Group III, aluminum acetate was poor, but the lead acetates (Group V) were good. Cobalt acetate (Group VIII) was a poor accelerator, although its salts are superior to those of lead when used in "drying oils" for the same purpose. Uranyl acetate in the radioactive Group VI was found to be a good accelerator. The salts with cations from Group VII were unsatisfactory.

Of all of the acetate salts tried, silver acetate appears to be the best as far as present knowledge is concerned. In the light of the previously postulated theory, it should decrease the solubility of the hardened cement markedly. This possibility, together with a possible germicidal effect, is being studied at the present time.

TABLE 4.—EFFECT OF VARIOUS CHLORIDE ACCELERATORS

Accelerator	Hardening Time Minutes Eugenol	Oil of Bay	Guaiacol	Solubility of Accelerator Gm./100 Ml.
Zinc chloride	>1	>1	>1	432.0
Calcium chloride	>1	>1	>1	59.5
Lithium chloride	>1	>1	>1	45.4
Stannous chloride	1	2	1	83.9
Stannic chloride	4	5	3	s.
Ferrous chloride	3	4	2	64.4
Ferric chloride	4	4	5	74.4
Cupric chloride	6	8	6	43.5
Cobalt chloride	7	6	7	190.7
Cuprous chloride	13	16	60	1.52
Manganese chloride	7	12	5	62.2
Aluminum chloride	13	11	13	69.9
Magnesium chloride	28	15	26	35.3
Nickel chloride	30	28	26	254.0
Sodium chloride c.p.	53	44	28	35.7
Sodium chloride (table)	80	41	36	....
Silver chloride	10 hours	5.5 hours	8 hours	0.000089
Lead chloride	16 hours	12 hours	13 hours	0.673
Barium chloride	11 hours	9 hours	8 hours	31.0

CHLORIDE AND NITRATE ACCELERATORS

It was thought best to study salts with anions other than acetate, such as the chlorides and nitrates.

The data for the metallic chlorides are shown in Table 4.

Table salt, even in small concentration, is an accelerator. Saturation of a metallic compound decreases its acceler-

ating properties, because the increased valence value of metals renders them less reactive; i.e., ferrous chloride ($FeCl_2$, ferric chloride ($FeCl_3$), stannous chloride ($SnCl_2.2H_2O$), stannic chloride ($SnCl_4$). The tin chlorides were found more effective than iron chlorides. Both are reducing agents. With cuprous chloride, which has a low solubility, the mixture hardens with eugenol in thirteen minutes; with guaiacol, in one hour in 0.5 per cent concentration. In 1 per cent concentration, the cement hardens with eugenol in seven minutes and turns green. With guaiacol, fifty minutes is required and the cement remains white. Repeated tests yielded the same results. The hardening time, using the three liquids, varies only slightly in the presence of satisfactory accelerators other than cuprous chloride.

The nitrates (Table 5) selected were found to be, as a class, the most effective accelerators. However, before advocating their use, the other properties of the hardened cement must be investigated thoroughly. These salts are very soluble and even chemically unstable. With the exception of silver nitrate, they are also either deliquescent or hygroscopic.

TABLE 5.—EFFECT OF DIFFERENT NITRATE ACCELERATORS

Accelerator	Hardening Time Minutes Oil of Bay Eugenol	Guaiacol	Solubility of Accelerator Gm./100 Ml.
Zinc nitrate	>1	>1	327.3
Lithium nitrate	>1	>1	52.2
Aluminum nitrate	>1	>1	63.7
Bismuth nitrate	3	2	d.*
Silver nitrate	3	2.5	122.0
Cobaltous nitrate	3	3	133.8
Ferric nitrate	4	3	s.
Nickelous nitrate	7	3	238.5
Magnesium nitrate	70	90	....
Sodium nitrate	3 hours	1¾ hours	73.0
Barium nitrate	3 hours	2 hours	8.7
Lead nitrate	4½ hours	2 hours	37.65

*d., decompose

TABLE 6.—HARDENING TIME WITH PURE ZINC OXIDE POWDER AS AFFECTED BY SEVERAL ACCELERATORS

Accelerator*	Liquid Oil of Bay Eugenol	Guaiacol
Zinc oxide (alone)	3 days	24 hours	24 hours
Silver nitrate	13 minutes	30 minutes	8 minutes
Zinc acetate	16 minutes	35 minutes	16 minutes
Silver acetate	20 minutes	60 minutes	22 minutes
Uranyl acetate	28 minutes	40 minutes	28 minutes
Cuprous chloride	90 minutes	150 minutes	120 minutes

*Used in 0.5 per cent concentrations with pure zinc oxide powder; arranged in order of decreasing accelerating action.

EFFECT OF ROSIN

Inasmuch as zinc oxide-eugenol cements are occasionally used without rosin,[18] the action of a few of the accelerators was tested in the absence of rosin (Table 6). It was found necessary to reduce the powder:liquid ratio to 0.75 gm./0.15 ml. (cc.) in order to maintain approximately the same consistency as before.

It is evident that acceleration is obtained, but in the concentrations used,

the accelerators are not so effective as before. Apparently rosin is an active ingredient of some nature in the powder. It further appears to improve the working properties and to reduce the friability of the hardened cement.

It may be noted that the zinc oxide-oil of bay cement hardened more rapidly than did the zinc oxide-eugenol cement, but the zinc oxide-rosin-oil of bay cement hardened even more rapidly (Table 2). The data suggest that rosin is essential to a rapid hardening rate as well as the accelerator.

heating to 275° F. (135° C.), and no hardening occurred after the mixture was heated to 400° F. (204.4° C.). Natural resins with low acid numbers such as clear amber, gum kauri, a special resin* and synthetic resins such as "flexoresin" (no acid number) and polymethyl methacrylate were substituted for the original resin in the zinc oxide powder, but without success.

EFFECT OF LIQUID COMPOSITION

As might be expected, the composition of the liquid affects the hardening time

TABLE 7.—EFFECTS ON HARDENING TIME OF SUBSTITUTIONS IN THE LIQUID PORTION OF ZINC OXIDE-ROSIN CEMENTS

	Liquid					
Accelerator*	Eugenol	Eugenol-Phenol	Eugenol-Furfural	Guaiacol	Guaiacol-Phenol	Guaiacol-Furfural
$Fe(NO_3)_3$	2	1	>1	..	..	..
$FeCl_2$	2	..	1	2	..	1½
$CuCl_2$	3	2	1.5	3	3	2
$MnCl_2$	..	..	..	3	..	2
$FeCl_3$	..	..	..	3	..	2
$AlCl_3$	6	4	2	..	..	..
$Ag(C_2H_3O_2)$	6	5	4	5	4	4
$CoCl_2$	..	..	..	6	7	3
$MgCl_2$	11	7	5	..	..	..
$Zn(C_2H_3O_2)_2$	12	8	8	6	..	5
$UO_2(C_2H_3O_2)_2$	15	13	12	6	4	3
Cu_2Cl_2	20	19	11	60	..	45
$NiCl_2$	35	30	16	17	..	10
NaCl	75	60	35	..	..	..
$Ni(NO_3)_2$	120	90	60	..	..	..

*0.5 per cent concentration in a zinc oxide-rosin (70-30 per cent) mixture.

Bare[19] states that a direct proportional relationship exists between the acid number of the rosin and its solubility. Furthermore, it is a well-known fact that the higher the acid number of the rosin, the greater its chemical reactivity. Assuming that such relationships might obtain under the conditions of these experiments, the acid number of the rosin was reduced by heating the cement powder to 275° F. (135° C.), which is just below the fusing point of the rosin, and 400° F. (204.4° C.). Both procedures definitely increased the hardening time from four minutes for the rosin mixture before heating to eleven minutes after

of the cement (Tables 1-6). Two possible causes for this have been investigated: the effect of (1) the phenol content, and (2) the solubility of the rosin in the liquid. One gram of phenol was added to the liquid to investigate the first-mentioned possibility, and 1 ml. of furfural, a rosin solvent which is not a phenol, was added to test the second idea. Ten milliliters of liquid were used in all cases.

The data are given in Table 7. Any difference in results between those in this table and previous tables may probably

*Staybelite Ester No. 10, Hercules Powder Co.

be attributed to slight differences in humidity and room temperature, since all other variables were held identical as far as possible except as mentioned in the previous paragraph.

According to the data in Table 7, the phenol enhances the action of the accelerator, but so does the furfural. In fact, the furfural is somewhat more effective than the phenol, but it is not known whether this is due to the more rapid solvent action of the furfural on the rosin, to a difference in concentration between the phenol and furfural, or to a chemical reaction which is more rapid with the unsaturated furfural.

Two facts are made clear by these experiments: (1) rosin is necessary to a short hardening time of the cement when an accelerator is used (Table 6 and 7) and (2) phenolic groups are probably only one of many organic radicals which aid in the chemical reaction during the hardening of these cements. It is not known how many organic radicals may be effective in this connection, but the foregoing experiments appear to indicate that the reaction is by no means simple.

Essential oils containing phenol derivatives (anethol, safrol, thymol, carvacrol) were tried, but without success.

SUMMARY AND CONCLUSIONS

Variables which affect the hardening time of zinc oxide-rosin-eugenol cements were studied: composition of the powder, composition of the liquid and the use of various accelerators. It was shown that:

1. An accelerator is necessary inasmuch as the various liquids used failed to give a sufficiently short hardening time.

2. Oil of bay and guaiacol can be successfully substituted for eugenol, with a different taste and odor resulting. Other essential oils containing a phenol derivative were tried without success.

3. Various metallic salts were found to be effective accelerators, such as acetates, chlorides and nitrates. It was suggested that salts of low solubility would reduce the solubility of the set cement. The nitrates are probably contraindicated as accelerators for this reason, and also because many of them are chemically unstable. Probably silver acetate and cuprous chloride come the closest to being ideal accelerators.

4. Resins, natural or synthetic, with low acid numbers cannot be substituted for natural or ordinary hydrogenated resin.

5. Rosin is necessary to a short hardening time.

6. The hardening reactions of these cements are by no means simple.

BIBLIOGRAPHY

1. SOREL: Proce'de' pour la formation d'un ciment tres solide par l'action d'un chlorure sur l'oxyde de zinc. *Compt. Rend. Acad. Sc.*, 41:784-785, 1855.

2. KING, J. S.: Treatment of Exposed Pulps. *D. Cosmos*, 14:193-194, April 1872.

3. TAFT, J.: Practical Treatise of Operative Dentistry. Philadelphia: Lindsay & Blakiston, 1877, p. 301.

4. CHISHOLM, E. S.: *D. Register*, 27:517, December 1873.

5. FLAGG, J. F.: Dental Pathology and Therapeutics. *D. Cosmos*, 27:465, September 1875.

6. SMITH, D. D.: Combination and Therapeutic Action of Some Filling Material. *D. Cosmos*, 20:525, October 1878.

7. TOMES, JOHN, and TOMES, CHARLES: System of Dental Surgery. Ed. 3. London: John Churchill, 1887, p. 414.

8. WESSLER, J.: Pulpol, ein neues medicamentoses Cement. *Deutsche Monatschr. f. Zahnheilk.*, 12:478-484, 1894.

9. HENTZE: Die Behandlung infizierter Zahnpulpen. *Deutsche Monatschr. f. Zahnheilk.*, 25:415-425, 1907.

10. ROSS, R. A.: Zinc Oxide Impression Pastes. J.A.D.A., 21:2029, November 1934.

11. *Tijdschr. v. Tandheilk.*, 35:412-416, 840-842, 1928; 36:38-41, 197, 1929.

12. WEYERHAUSER, KARL: Wieheit ist die Expansion des Zinkoxyd-Eugenols imstande, die Kontraktion der Albrechtschen Wurzelfullung auszugleichen. Marburg, 1922.

13. FORSTER, E.: Il cemento prorvisorio all' ossido di zinco ed il carattere fisicomeccanico della sua presa. *Stomatologia*, 27:217-221, March 1929.

14. HOWE, P. R.: Conservation of Dental Pulp. *D. Items Int.*, 41:933-941, December 1919.

15. WALLACE, D. A., and HANSEN, H. L.: Zinc Oxide-Eugenol Cements. J.A.D.A., 26: 1536-1540, September 1939.

16. PAFFENBARGER, G. C., and CAUL, H. J.: Dental Cements. *Proc. D. Centenary Celebration*, March 1940, pp. 232-240.

17. FRITZ, F.: Die Trockenstoffe und ihre Verwendung. *Chem. Zeitung*, 60:921-924, 1936.

18. GRAHAM, F. W., JR.: Silver Nitrate and Zinc Oxide in Treatment of Children's Teeth. J.A.D.A., 28:124-128, January 1941.

19. BARE, W. K.: Rosin as a Linoleum Component. Symposium on rosin, 1930.

311 East Chicago Avenue.

CREATION OF A MANDIBULAR RIDGE BY DEEPENING THE LABIAL SULCUS AND LINING IT WITH A SKIN GRAFT

By HAROLD S. GORNEY, D.M.D.; ARTHUR J. GORNEY, M.D., and SAMUEL FOMON, Ph.D., M.D., Boston, Mass.

THE dentist is frequently confronted with the problem of making a full lower denture for a patient whose alveolar process has been resorbed to such an extent that the use of this part of the mouth as a retentive and stabilizing factor is impractical. In these cases, the usual practice of using the mylohyoid ridge and sublingual fossa region for retention seldom proves satisfactory. At best, this part of the mouth provides insufficient anchorage, allowing the denture to become movable. Moreover, any small portion of the alveolar process which remains and may assist in retaining the denture is likely to be resorbed, and this necessitates frequent trimming of the denture, reducing the already poor retentive ability of the part.

The question as to what to do to increase the comfort and efficiency of a denture under these circumstances arises. It is generally agreed that it is best to deal with the problem by recourse to a common surgical procedure, the creation of a ridge by the formation of a prealveolar sulcus. The mandible is thus enabled to furnish the desired support.

On this principle, many surgical procedures have been suggested. A common procedure is to incise the labial fold along the alveolar margin, deepen the cavity to the desired level and attempt to prevent union of the resultant raw surfaces by interposing a piece of rubber dam and suturing it in place. Kazanjian[1] incises the mucosa parallel to and at some distance (1.5 cm.) from the alveolar ridge, undermines the tissues medially and pushes the flap thus formed down against the periosteum of the mandible and sutures it in place. Sometimes, the radio knife is resorted to, on the grounds that its use reduces the amount of cicatrization to a minimum and thus prevents to some extent a reobliteration of the newly formed sulcus when healing takes place. The final results of these and other methods have been only partially satisfactory and, in some instances, totally unsuccessful, in that little or no provision is made against subsequent reunion of the raw surfaces by the inevitable formation of scar tissue.

That this complication has been satisfactorily overcome by a method suggested by one of us (S.F.),[2] featuring the use of an inlay skin graft, was evidenced by the gratifying results of the procedure in the case here described.

REPORT OF CASE

History and Examination. — A woman, aged 40, whose lower teeth, with the exception of the left canine and first premolar, had been extracted one year previously because of a periodontal condition, the two remaining teeth being extracted three weeks before operation, had a ridge so deficient in height as to be almost on a level with the floor of the mouth. (Figs. 1 and 2.) The impossibility of properly fitting a denture was explained to the patient and she readily consented to an operation. She was admitted to the hospital on the night prior to the operation and was given the routine preoperative care.

Operative Procedure.—Under double mandibular block anesthesia, a sulcus of sufficient depth to assure retention of the denture

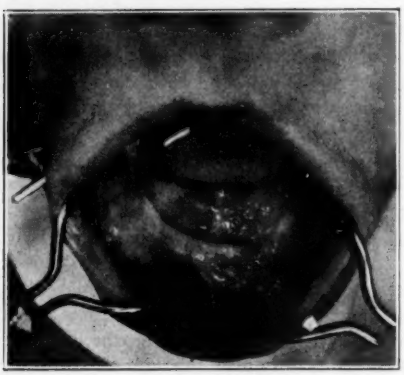

Fig. 1.—Remnant ridge before operation; showing area of resorption following extraction of lower left cuspid and first bicuspid three weeks previously.

was created along the base of the remnant ridge. A scalpel was inserted in the right molar area and carried through the mucosa along the labio-alveolar border to the left molar area. The knife was then carried down, close to the periosteum, to the desired level, care being taken not to injure this structure. (Fig. 3.)

To compensate for contraction, some degree of which is bound to follow the use of a thin razor graft, the bed was made somewhat larger than that ultimately required. After hemorrhage had been controlled by pressure, a piece of stent (a special form of dental compound), previously softened in hot water, was pressed into the cavity and molded by finger pressure on the overlying skin. It was held in place by gentle pressure until hardened and then carefully lifted out.

The compound was of such a size as to fill every crevice of the bed in which it was buried, but not so large as to cause more than a slight degree of tension when the cut edges of mucosa were sutured over it. Two sterile safety pins were heated and inserted securely in each end of the newly formed splint to facilitate handling, and it was temporarily set aside. (Fig. 4.) The sulcus, after removal of the stent, was firmly packed with gauze to further assure hemostasis, which must be absolute if the graft is to "take."

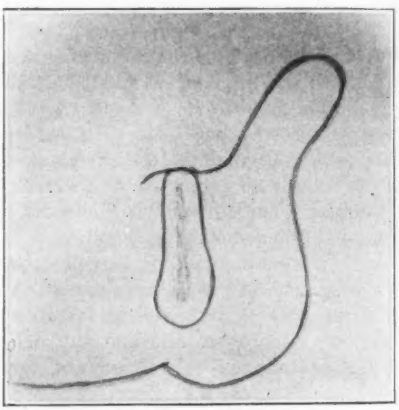

Fig. 2.—Sagittal section (diagrammatic) of Figure 1, showing deficient ridge.

From a selected area on the right thigh, previously cleansed with green soap and water, alcohol and ether, a thin razor graft was cut. Then the graft, raw surface out, was wrapped smoothly around the stent mold, the graft edges meeting along the upper margin of the mold. (Fig. 4.) The gauze pack was removed from the sulcus and, by means of the pins, the graft-covered mold was inserted in it, after which the pins were clipped. The cut edges of the mucosa were sutured over it under slight tension, the mold remaining buried snugly between the lip and the mandible. (Fig. 5.)

As the success of a graft depends to a large extent on complete immobilization, a

special dressing was applied. With this in view, a splint similar to the Gunning type had been constructed, consisting of upper and lower trays made of vernonite, connected in bite relationship. (Fig. 4.) In the center, an opening was made for the intake of food and to allow for possible vomiting. To prevent any up-and-down motion, the mandibular labial flange was prolonged so as to cause firm, gentle pressure on the mold. This splint was inserted in the mouth and

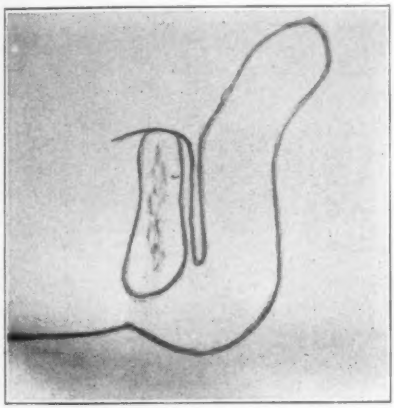

Fig. 3.—Sagittal section showing newly created sulcus.

bilization was completed by the use of the ace bandage. (Fig. 6.)

While the pressure dressing was being applied, the denuded area on the thigh from which the graft had been taken was covered with several layers of sterile vaselin gauze overlaid with a dry gauze dressing.

Postoperative Care.—The patient was put to bed in the dorsal position and sand bags were placed on each side of the head. The dressing was not disturbed for seven days, during which time the patient was on a

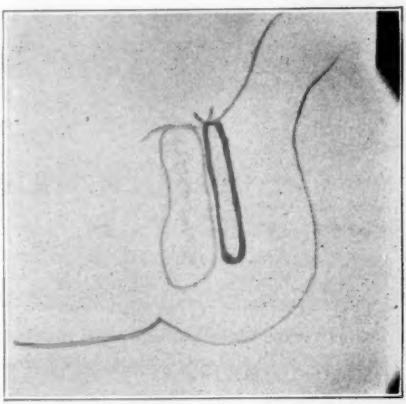

Fig. 5.—Graft-covered mold sutured in place.

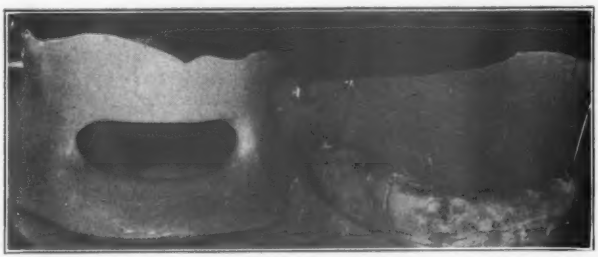

Fig. 4.—Right, stent mold of newly formed sulcus, with pins in place. Left, specially constructed splint with opening for intake of food.

fell easily in place over the parts. The chin was smeared with petrolatum, and over it a piece of softened stent lined with felt was carefully molded, being held in position until it hardened. Several layers of cotton padding were laid over this, and the whole was held in place by a 2-inch bandage firmly wrapped around the head and chin. Immo-

liquid or semisolid diet, food being administered through a tube inserted in the opening in the oral splint. During this period, the mouth was cleansed frequently with an antiseptic mouthwash. Despite the cumbersome dressing, the patient was comfortable and no complications were encountered. On the eighth day, the pressure dressing was re-

moved, the stitches holding the graft-covered mold were cut, and the mold was carefully lifted out, leaving a skin-lined cavity. The result was most gratifying. The cavity was found to be lined with a membrane of grayish pink, as is characteristic of a freshly implanted graft. Its clean, smooth surface

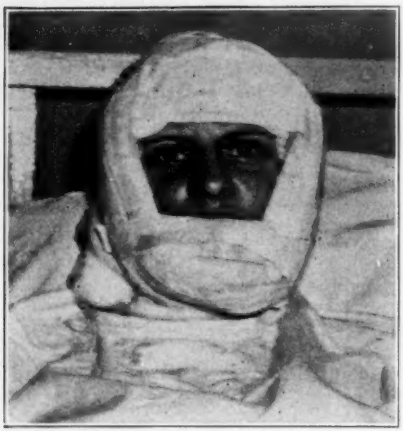

Fig. 6.—Patient after application of pressure dressing.

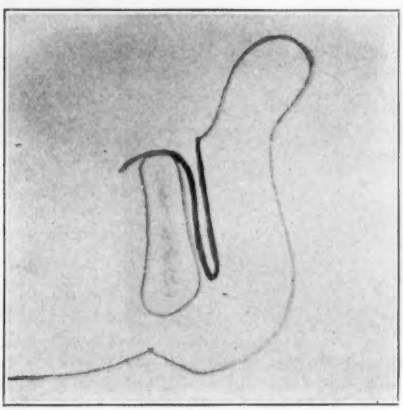

Fig. 7.—Sagittal section of newly lined sulcus.

gave evidence that all portions of the graft had "taken." (Figs. 7 and 8.)

The newly lined cavity was gently swabbed with sterile oil. The mold was reinserted in the sulcus in order to guard against undue shrinkage of the graft in its early stages. It was retained with a few sutures until the grafted surface was sufficiently stable to withstand the pressure of a denture.

The following week, an impression was taken and, one week later, the new denture was inserted. (Fig. 9.)

Outcome.—Examination of the ridge five weeks after the operation showed the graft gradually turning pink and acclimating itself to its new environment.

Fig. 8.—Ridge and newly lined sulcus after removal of stent.

Fig. 9.—Lower denture in place.

BIBLIOGRAPHY

1. KAZANJIAN, V. H.: Surgery as Aid to More Efficient Service with Prosthetic Dentures. J.A.D.A., 22:566, April 1935.

2. FOMON, SAMUEL: Surgery of Injury and Plastic Repair. Baltimore: Williams & Wilkins Company, 1939.

512 Little Building.

CLINICAL ASPECT OF LOCAL ANESTHETICS

By J. Keaveny, D.D.S., Washington, D. C.

LOCAL anesthesia has long been accepted as an essential agent in the practice of dentistry. Its availability and the apparent uniformity of results with a minimum of attention to its chemistry on the part of the operator have served to minimize certain phases of the subject which should have constant attention.

Then, too, there is some conflict of opinion among writers. Researchers in the field sometimes find themselves with little more result than what might be called, for want of a more accurate term, a consensus.

Yet it is of fundamental importance that the operator should know, and know fully, not only what agents he is using, but also why he is using these particular agents. In other words, the anesthesia should be related to the individual patient. Many conditions, some extremely harmful, even fatal, can and do arise from the use of anesthesia.

Early practitioners of the profession foresaw the day when pain incident to dental operations might be alleviated or eliminated. Their vision brought anesthesia into general use. They developed the "know how," but were not completely successful in recording the "know why." They knew that the effects of anesthesia are not necessarily confined to a controlled area; that certain types of patients react differently, and that some of these reactions, especially when they are elicited from important organs such as the heart and the central nervous system, are harmful.

Read at the Greater New York Dental Meeting, December 2, 1941, New York, N. Y.

In this discussion, an attempt will be made to departmentalize, so to speak, the subject of local anesthesia.

For the purpose of orderly presentation, I shall take up, first, the broad question of what is expected of anesthesia, and how it operates; proceeding to the topic: How the dangerous and systemic effects of local anesthetics are occasioned.

Finally, some of the better known drugs commonly used in dentistry for local anesthesia will be considered: procaine, monocaine, epinephrine, cobefrin and neosynephrin.

Throughout, it shall be the purpose principally to review the accepted literature in the field, without attempting to assay the authority or to arrive at a mathematical evaluation of the conclusions reached.

The ideal local anesthetic agent must have certain desirable properties. For instance, it should be non-irritating so as to cause no damage to nerve and other tissues in producing anesthesia. The anesthetic drugs, as absorbed at the site of injection, should have a low degree of systemic toxicity. The concentration of the drug should be effective without causing harmful effects. The lower the effective anesthetic concentration and the higher the fatal dose, the greater the margin of safety. The toxicity and efficiency of local anesthetic drugs are independent of each other, and dissociation of these factors is the basis of continuous research effort to find a safer and more effective anesthetic agent.

Local anesthetic drugs in effective concentration, applied to nerve tissue, block

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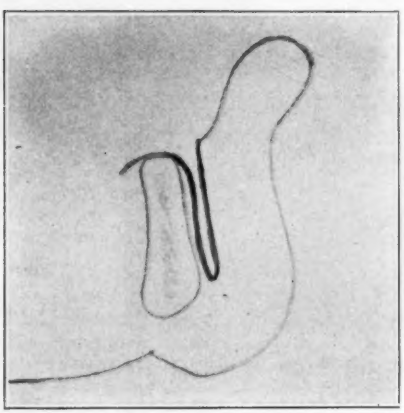

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Local anesthetic drugs in effective concentration, applied to nerve tissue, block

the conduction of nerve impulses by preventing reception of stimuli and transmission of sensory impulses. It is to be noted that, with the absorption of the agent, there is no structural damage to the nerve tissue, and the restoration of normal function of that injected nerve quickly follows its use. The onset of anesthesia and its duration is obviously important because these factors provide, within a reasonable limit, sufficient time for the intended surgical procedure.

There are many theories today concerning the action of anesthetic drugs, but the exact means by which anesthesia is produced by these drugs is not recorded. The two theories that have attained the greatest prominence and are probably the most feasible are the selective and the lipoid theory. In the selective theory, it is maintained that certain nerve fibers are more susceptible than others to the action of local anesthetic agents. For instance, it has been submitted that of the mixed nerves, the sensory fibers are affected before the motor fibers. It is contended that sensory fibers can be blocked by a proper concentration of anesthetic drug without abolishing the transmission of impulses over motor nerve fibers that are in close contact with sensory fibers. The local anesthetic drugs affect the sensory fibers in an established manner. The modality of temperature is the first to be affected, and then come, in order, abolition of the sense of pain, of touch and of pressure. The size of a nerve fiber is also a potential factor in determining the degree of depression elicited by the action of the drug used. Since motor and sensory fibers are characterized by the presence of and the absence of myelinization, the extent of the loss of function as caused by the anesthetic agent varies, as we proceed from the unmyelinated to the myelinated, and from the smaller to the larger.

The other theory concerning the action of local anesthetic drugs on nerve fibers is the lipoid theory, probably the more plausible of the two in the light of present-day knowledge. This theory is closely related to the Meyer-Overton[1] theory, which sets up a parallel between the affinity of anesthetic drugs to lipoid substances and the resultant depressant action. Anesthetic potency is increased to the extent that the agent is soluble in oil, and is decreased to the extent that it is soluble in water.

Hydrolysis is the medium by which the free base of the compound is liberated for selective action upon the lipoids of the sensory nerve cells. This chemical action is caused by the small amount of alkali normally present in the tissue fluids. The degree of hydrolysis, liberating the free base of the anesthetic compound, is influenced by the strength of the anesthetic solution and the alkalinity of the tissues and their fluids. In explanation of this theory: If a local anesthetic agent is present as the salt of a strong acid, that is, a hydrochloride, the spontaneous hydrolysis which takes place will be small. If, however, the local anesthetic agent is present in the salt of a weak acid, the degree of hydrolysis is much greater. For this reason, boric acid solutions of local anesthetic agents are used.

Drugs used in local anesthesia are capable of producing toxic disturbances and may even cause death. Although this fact is accepted by most authorities in the dental and medical field, these agents are used extensively in everyday practice. The common use of these potentially dangerous drugs has lulled the profession into an unwarranted sense of security.

In 1928, the Editor of THE JOURNAL[2] called the attention of the profession to the inherent dangers of local anesthesia. He referred to a report made under the auspices of the American Medical Association on the toxicity of agents used in local anesthesia, describing forty-three fatalities attributed to the use of local

anesthetic agents. Some of these deaths occurred during dental operations.

The locale of injection of these drugs explains in part the incidence of fatalities. Bieter[3] explains that injection of local anesthetic drugs into highly vascular areas, such as the nose, throat and urethra, is responsible for a fatal outcome.

Leset[4] adds to these areas the regions of the bladder and the spinal cord, explaining that so long as we have a drug or a combination of drugs with low toxicity and prolonged anesthesia, these regions will always be a source of danger. In dental records, even minute doses of the safest of all local anesthetic drugs, procaine, have been responsible for such serious results.

Tainter[5] has clearly and comprehensively presented this phase of local anesthesia, and reference to his writings is always worth while. He points out that all drugs tend to stimulate and then depress physiologic function. This postulate applies, of course, to drugs used to produce local anesthesia. These drugs, when in contact with the sensory nerve tissue, usually cause a depression or paralysis of nerve function, although, in some instances, we may find a primary reaction of local pain as a result of stimulation.

If the anesthetic solution were ideal, it would remain localized at the site of injection and would produce only local changes. However, since absorption invariably occurs, the drug is taken up by the circulation to be distributed to other parts of the body, there to act on remote organs or tissues. This action on the remote structures is called systemic reaction or side-effect.

The synergistic action of a local anesthetic drug may intensify these systemic reactions. For instance, cocaine sensitizes the sympathetic nerve system to stimuli. When epinephrine is used with cocaine, the latter is responsible for an intensified reaction to the epinephrine. Since epinephrine normally accelerates the circulatory responses, these responses would be magnified by the use of epinephrine with cocaine. If the patient has cardiovascular disease, this intensified response might be dangerous or even fatal. This sensitizing power is possessed by no other local anesthetic drug. For this reason, and because of its high degree of toxicity, cocaine is never injected into the tissues or the circulation.

The remote organ commonly affected in systemic reactions is the central nervous system, the components of which are the brain, the medulla and the spinal cord. Local anesthetic drugs may cause either a stimulation or a depression of these areas, and the response elicited is peculiar to the area affected.

In stimulation of the brain, the patient has a reaction of apprehension, restlessness, tremor, muscular twitching and hallucinations. In medullary stimulation, responses of the vasomotor, respiratory and the emetic center are elicited. In respiratory excitation, the rate and depth of respiration are increased. In vasomotor stimulation, an elevation of the blood pressure occurs, with an increase in pulse rate and a blanching of the skin. Nausea and vomiting follow stimulation of the emetic center.

Depression of these centers effects a different type of reaction. Cerebral depression produces fainting, loss of consciousness, with muscular relaxation. In medullary depression, when the respiratory center is affected, there is inadequate ventilation of the lungs due to a decrease in the rate and depth of respiration. Should this reaction continue uninterrupted, asphyxiation follows. Severe asphyxiation may cause stimulation of the spinal cord and other centers, bringing about a rise in blood pressure and convulsions. This picture may be misinterpreted as the beginning of a stimulative action; whereas it is a phase of asphyxiation. Depression of the vaso-

motor center may cause a severe form of shock or collapse characterized by a drop in blood pressure, slowing of the pulse rate, paling of the skin, decrease in rate of circulation and drop in body temperature. The decrease in the circulation rate may be such as to result in inadequate oxygenation of the body tissues. Finally, the reactions produced by a local anesthetic compound may be a symptom complex of stimulation and depression.

As we consider the battle of toxicity versus efficiency, we find that these symptoms are common to all local anesthetic drugs. The factors usually responsible for these toxic manifestations are: overdosage of the drug, lack of epinephrine, normal dosage in susceptible persons and inadvertent intravenous injection.

Of the many drugs created in the research laboratory, there are but a few which have met the requirements of common use in dentistry. In the main, these are procaine, epinephrine, cobefrin and neosynephrin, and, in late years, to a degree, monocaine.

Procaine, synthesized by Einhorn in 1903, attains the highest degree of importance among the local anesthetic drugs. It is prepared in the form of procaine hydrochloride, procaine borate and procaine nitrate. It is about one-ninth as toxic as cocaine, when given subcutaneously. Because the free base is not water soluble, it is prepared in an acid salt, to be made available for common use. It is a vasodilator and must be used with a vasoconstrictor to be efficient. Although it is the least toxic of local anesthetic drugs, systemic effects do occur, especially in sensitive individuals.

Idiosyncrasy to the drug, fortunately rare, has been responsible for deaths even when extremely small doses have been used.

The greatest single attempt to reduce the toxicity of procaine is probably the development of the alkaline solutions. In 1910, Gros[6] learned that, by the addition of sodium bicarbonate, the induction period of anesthesia was shortened for isolated nerve tissue. Sollmann,[7] in 1918, confirmed this finding and showed that the efficiency of cocaine and procaine for both motor and sensory nerves was increased by the addition of sodium bicarbonate. He further pointed out that this salt does not increase intracutaneous anesthesia. Bieter[8] thinks that this feature probably holds good for infiltration anesthesia.

In 1930, Goldberg[9] emphasized that the more acid there is in a procaine solution, the longer the time required for induction and the greater the probability of postoperative pain.

At the same time, Freeman[10] published his reports on alkaline local anesthetic solutions. He suggested certain advantages for alkaline solutions, principally because this solution has a pH approximating that of the blood and tissue fluids. The induction time of anesthesia was shortened by the rapid dissociation of the base in the alkaline medium, bringing about a more rapid action of the free base on the nerve fiber. The alkaline solution causes less local irritation, because the alkali of the tissues is not diverted to neutralize the usual acidity of local anesthetic solutions.

Experimentally, Freeman maintains his point in a satisfactory manner. Clinically, he offers the testimony of his observations over a satisfactory period of time and on what is regarded as a sufficient number of instances.

Harvey[11] supports Freeman when he states that the induction of anesthesia is accelerated and the postoperative sequelae are alleviated by the alkalinization of procaine.

Gwinn and Ferber[12] also claim that these features of local anesthesia are influenced favorably when the pH of the solution is close to that of the blood and body tissues.

Thus the supporters of the alkaline

solution are unanimous in concluding that it is of benefit, because the induction time of anesthesia is shortened, the duration of anesthesia is satisfactory and local and systemic reactions are eliminated or minimized. It may be said that, from their projected viewpoint, the proponents of the use of alkaline solutions have been successful to a degree satisfactory to both the operator and the patient.

This position in regard to alkaline solutions is not without opposition in the ranks of the profession. Tainter *et al.*,[13] in making certain observations about the buffering action of the body tissues, doubt the importance ascribed to the alkaline solutions. They observe that if an anesthetic solution is neutralized by an equal volume of tissue fluid, there will result a change in the pH of only 0.07. If the anesthetic solution is neutralized by a greater volume of tissue fluid, as is the probability in ordinary cases, the shift in pH must be even less than this minor deviation. The pH of the body and its tissue fluids can fluctuate from patient to patient throughout several times this range without adverse physiologic effects. It is, therefore, questionable whether any such change in the pH as 0.07 is of significance locally or systemically.

Using the "blind test" to determine the local anesthetic efficiency of a 2 per cent procaine hydrochloride solution with a pH of 5.6 and a 4 per cent procaine borate, Tainter[14] found no differences between the solutions as to the volumes required or the time necessary for anesthesia or duration of anesthesia. He did, however, find that the procaine borate solution produced systemic reactions definitely less favorable.

Miller[15] says that his clinical experience is not in harmony with that of the proponents of use of the alkaline solution. He further states that procaine solutions, acid and alkaline, have approximately the same reactions locally, whereas the systemic effects of the alkaline solution are less favorable.

Freeman,[16] refuting Tainter, says that his findings are invalidated by the fact that a 4 per cent procaine borate solution contains considerably more anesthetic base than does the 2 per cent procaine hydrochloride solution. This increased amount of procaine explains the less favorable reactions of the alkaline solution.

However, Goodman and Gilman[17] point out that the borate radical so increases the molecular weight of the compound that the concentration employed must be increased by 50 per cent. Thus, it is seen that there is not the greater quantity of anesthetic base in the 4 per cent procaine borate solution.

These conflicting opinions make it reasonable to conclude that the problem of the acid and alkaline solutions in regard to local and systemic reactions is still unsolved.

I agree with the position taken by Tainter, Miller and others and, from a clinical viewpoint, I am not satisfied that the results with alkaline solutions are superior to those with the acid.

The main disadvantage of these solutions rests upon their alkaloidal instability. Deterioration sets in rapidly, causing the anesthetic base to become an inert chemical compound. This deterioration is increased by the rapid oxidation of epinephrine when it is added. Because of the damaging effect of alkalinity and of time, the solutions offer a problem in sterilization and must be used at the time of preparation.

In an attempt to produce a substitute for procaine, Goldberg and Whitmore[18] developed an agent which they asserted was less toxic and more efficient. This drug was introduced by Nevin in 1937 as monocaine hydrochloride. Monocaine, a vasoconstrictor, is commonly used in combination with epinephrine in dilutions of 1:75,000 or 1:100,000. These lower dilutions of epinephrine may ex-

plain some of the more favorable reactions ascribed to its use. Accepted Dental Remedies[19] says that monocaine is 1.6 more toxic than procaine when injected intravenously in guinea-pigs. Its anesthetic efficiency is said to exceed that of procaine. It was introduced in a 0.75 per cent solution, and because this concentration was found to be ineffective, it is now available in a 1 per cent solution for surgical procedures and in a 1.5 per cent solution for operative procedures.

Tainter[20] states that the toxicity of this drug exceeds that of procaine and that it is responsible for a higher incidence of postoperative disturbances and systemic reactions.

No discussion of local anesthesia is complete without a consideration of vasoconstrictors. Local anesthetic drugs must be combined with a vasoconstrictor to attain a satisfactory degree of efficiency. The Council on Dental Therapeutics[21] outlines the requirements of an efficient vasoconstrictor.

A vasoconstrictor constricts the blood vessels and thus localizes the anesthetic solution. This localization prolongs the period of anesthesia and retards absorption of the solution by the blood stream. The toxicity of the drug with which the vasoconstrictor is combined is diminished and a toxic blood level is avoided.

The vasoconstrictor most commonly used in local anesthesia is epinephrine. Epinephrine answers the foregoing requirements, but is also responsible for some additional effects. It stimulates the myocardium, accelerates the heart rate and produces a characteristic rise in blood pressure. The rhythm of the heart beat may also be altered. These responses may be modified by the presence of disease and general anesthesia, although, normally, they are controlled by compensatory reflexes, which restore the cardiovascular action. Serious accidents may follow the use of epinephrine in patients suffering from hypertension or arteriosclerosis. With acceleration of the heart beat, there may be increased cardiac irritation, which may, especially in the presence of disease or anesthesia, through the action of epinephrine, cause a cardiac arrythmia. It is in the presence of this type of cardiac disturbance that fatalities occur in the induction stage of general anesthesia.

The toxic symptoms common to the use of epinephrine are fear, anxiety, tenseness, apprehension, restlessness, throbbing attacks, tremor, weakness, dizziness and palpitation. These symptoms are controlled by rest and quiet and the use of minimal dosages. The use of epinephrine can have harmful local effects. Seraphin[22] reports that a concentration of 1:20,000 in a 2 per cent procaine solution may cause a local necrosis. For injection purposes, the concentrations of epinephrine commonly used range in dilution from 1:50,000 to 1:100,000.

The dental literature is replete with evidence of the excitatory effects of epinephrine. On the other hand, Borg[23] concludes that the small amount of epinephrine in local anesthetic solutions is not related to any changes in pulse rate or pulse pressure. It is his contention that reactions of the circulatory system in apprehensive, nervous patients are of greater consequence than those produced by epinephrine.

Pickering *et al.*,[24] speaking of the pressor action of vasoconstrictors in local anesthetic solutions, are emphatic in saying that all normal subjects exhibit cardiovascular changes when a procaine epinephrine combination is injected.

It is probable that the circulatory effects from anesthetic solutions may be augmented by fear and apprehension regarding the impending operation.

Cobefrin and neosynephrin have been presented as substitutes for epinephrine. Cobefrin was introduced as an ischemic agent by Winter[25] in 1933. Accepted Dental Remedies 1940 [19] says that cobefrin is qualitatively similar to epinephrine.

It is less effective as a vasoconstrictor and in raising the blood pressure. Its lower circulatory efficiency is consistent with its lower systemic toxicity. It is used in concentrations about five times that of epinephrine. Neosynephrin as a vasopressor agent has about one-eighth the toxicity of epinephrine and one-sixteenth its efficiency. It has a duration capacity about twice that of epinephrine. The use of both cobefrin and neosynephrin, since they are epinephrine-like vasoconstrictors, may cause excitatory reactions through systemic activity.

CLINICAL APPLICATIONS

Procaine hydrochloride is still to be regarded as the safest of available drugs in local anesthesia. The alkaline solutions of procaine have not yet been proved on a scientific basis to excel the acid solutions. The use of local anesthetic drugs may have harmful effects and must be guided by care and good judgment.

Epinephrine remains the drug of choice in normal cases when vasoconstriction is required, although cobefrin and neosynephrin may be resorted to in cases of idiosyncrasy or incompatibility.

The possibility of toxic symptoms should be anticipated in the use of local anesthetic agents, and caution and care should be used to prevent them.

CONCLUSION

The prevention of the toxic reactions common to the use of drugs in local anesthesia is possible through thorough knowledge and intelligent understanding of the means to combat them.

BIBLIOGRAPHY

1. NEVIN, MENDEL, and PUTERBAUGH, P. G.: Conduction, Infiltration and General Anesthesia. Ed. 4. Brooklyn: Dental Items of Interest Publishing Co., 1939, p. 308.

2. Death from Use of Local Anesthetics. Editorial. J.A.D.A., 15:2354-2356, December 1928.

3. BIETER, R. N.: Applied Pharmacology of Local Anesthetics. *Am. J. Surg.*, 34:505, December 1936.

4. LESER, A. J.: Problems of Local Anesthesia. *Western J. Surg.*, 48:261, April 1940.

5. TAINTER, M. L.: Causes and Treatment of Systemic Reactions in Local Anesthesia. J.A.D.A., 20:152-155, January 1932.

6. GROS, O.: Ueber die Narkotika und Local anästhetika. *Arch. f. Exper. Path. u Pharm.*, 63:80, 1910.

7. SOLLMANN, T.: Comparative Activity of Local Anesthetics. *J. Pharm. & Exper. Therap.*, 11:1, February 1918.

8. Reference 3, p. 504.

9. KOCH, E. F.; GOLDBERG, S. D., and GRALNICK, ABRAHAM: Preliminary Report on Investigation of Postoperative Sequelae of Toxicity of Anesthetic Solutions. *D. Items Interest*, 52:865, November 1930.

10. FREEMAN, C. W.: *D. Cosmos*, 71:949-1929, October 1929.

11. HARVEY, H. E.; DEFORD, C. C., and ELLER, C. C.: Acceleration of Local Anesthetics and Alleviation of Postoperative Sequelae by Alkalinization of Procain Solutions. *D. Cosmos*, 74;600, June 1932.

12. GWINN, C. D., and FERBER, E. W.: Relationship of Hydrogen-Ion Concentration to Efficiency and Toxicity of Local Anesthetic Solutions. J.A.D.A., 23:1298, July 1936.

13. TAINTER, M. L.; THRONDSON, A. H., and MOOSE, S. M.: Alleged Clinical Importance of Buffered Local Anesthetic Solutions. J.A.D.A., 26:920-927, June 1939.

14. *Idem:* Comparison of Procaine Hydrochloride and Procaine Borate as Local Anesthetics. J.A.D.A., 24:386, 1937.

15. MILLER, H. C.: Local Anesthetics and Vasoconstrictors. J.A.D.A., 25:391, March 1938.

16. FREEEMAN, C. W.: Local Anesthetic Agents Used in Dentistry. J.A.D.A., 28:103, January 1941.

17. GOODMAN, LOUIS, and GILMAN, ALFRED: Pharmacological Basis of Therapeutics. New York: Macmillan Company, 1941, p. 298.

18. GOLDBERG, S. G., and WHITMORE, W. F.: Preparation of Para-Aminobenzoic Acid Esters of Monoalkylamino Alcohols. *J. Am. Chem. Soc.*, 59:2280, 1937.

19. Accepted Dental Remedies. Ed. 6. Chicago: American Dental Association, 1940.

20. TAINTER, M. L., and THRONDSON, A. H.: Clinical Results with Monocaine as Local Anesthetic. J.A.D.A., 28:1209-1218, August 1941.

21. Epinephrine Substitutes and Reactions in Local Anesthesia. J.A.D.A., 17:2305-2307, December 1930.

22. SERAFIN, F. J.: Precaution in Use of Procaine-Epinephrine for Regional Anesthesia. Corres., *J.A.M.A.*, 91:43, July 7, 1928.

23. BORG, F. A.: Effect of Procaine-Epinephrine Solutions on Pulse Rate and Blood Pressure. J.A.D.A., 21:868-873, May 1934.

24. PICKERING, P. J., *et al.*: Possible Cardiovascular Changes in Local Anesthesia. J.A.D.A., 26:1823, November 1939.

25. WINTER, LEO: Experimental and Clinical Investigation of New Ischemic Agent for Use in Local Anesthetic Solutions. *D. Outlook*, 20:525, December 1933.

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VERTICAL DIMENSION IN COMPLETE DENTURE PROSTHESIS

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WHEN the mandible is raised from rest position to normal occlusal contact of the posterior teeth, vertical dimension as regards the maxillae has been established. The contact of these posterior teeth did not determine the rest position or the vertical dimension: it was established before the eruption of the teeth by the tension of several groups of muscles associated with mandibular movements. The action of these muscles, in growing simultaneously with the teeth, caused a constant relationship to be maintained between the teeth and the jaws.

Thompson points out that the spatial relationship of the mandible to the cranium is maintained by the tension of certain muscular groups, and, therefore, the position of the mandible during rest or deglutition is determined, not by the teeth, but by the musculature running to it from above and below.

Brodie, utilizing the Broadbent-Bolton cephalometer, as reported by Thompson, has shown that the angle formed by a line representing the anterior cranial base with a line representing the lower border of the mandible tends to remain constant. This angle is established before any of the teeth have erupted. Another constant angle is that formed by the same cranial base and the plane of occlusion. The remarkable constancy of these angles confirmed his opinion that the mandible is suspended in a position of physiologic rest between the hyoid bone and the skull by an equilibrium of muscular tension above and below it.

Another constant relationship is that of the anterior teeth to the respective lip, which, when the lips are slightly parted, is approximately the same length. Their total length, however, in the majority of cases, is greater than the vertical ridge separation. This difference causes the upper teeth to overlap the lower (overbite), or vice versa. Therefore, we cannot depend on reproduction of the length of the anterior teeth, with the exception of the end-to-end bite (about 8 per cent), wherein the amount of ridge separation and the length of the anterior teeth are the same, to determine vertical dimension.

When we consider that the natural overbite of anterior centric occlusion ranges from −2 mm. (open bite) to 0 (end-to-end), to 6+ mm., and that, during speech, the mandible is above its rest position and that there is always at least 1 mm. of incisal clearance, it becomes evident that there must be a wide divergence in the free-way space created by the position of the mandible at rest and determined by the associated musculature and the position of the mandible at centric occlusion of the teeth. There-

fore, no case exists with a free-way space of 1 mm., but there are cases of 8 mm. or more. (1 mm. below speech position + 1 mm. incisal clearance + 6 mm. overbite = 8 mm. free-way space.)

In the sounding of such letters as M, the lips make contact and contraction of the musculature associated with the sound elevates the mandible to a position above its rest position. This establishes a definite relationship of the incisal edges of the teeth, and we now have what we term a "minimum clearance" space (about 1 mm.) between these anterior teeth. The minimum clearance, being practically constant, is valuable in checking the length of the artificial anterior teeth as it is maintained after the loss of the teeth by parallel mandibular movements of speech. The position, being easy to record and important for correct speech, comfort and efficiency in complete dentures, will be used as a step in obtaining the vertical dimension.

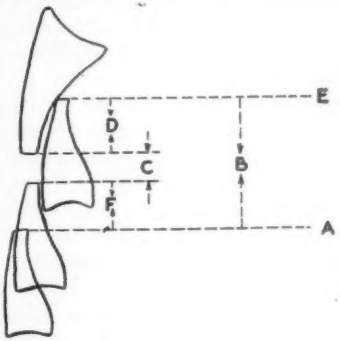

Fig. 1.—A, incisal relationship with mandible at rest; lower surface of free-way space. B, free-way space (6.5 mm.). C, minimum clearance space. The M and the hiss sound place the mandible in this position. D, overbite (3 mm.). E, relationship in this particular case when mandible has reached its vertical dimension by involuntary deglutition. F, space between M-sound level and rest position; in this case, 2.5 mm.

During enunciation of the letter M and before the mandible returns to its rest position, it is 1 mm. (minimum clearance) plus the number of millimeters of anterior overbite below its normal vertical dimension. (Exception to be noted in some cases of extreme natural overbite.)

Deglutition can be accomplished with the mandible at various levels, depending on the interference present and the effort exerted. However, when it is performed as an involuntary act, as in swallowing the saliva, the musculature, having grown simultaneously with the associated anatomic parts, automatically places the teeth in centric occlusion. In this position, the mandible is at the normal vertical dimension.

Fig. 2.—Recording trays attached to lower base by means of retaining plates from which they can be removed and reseated by means of attachment on buccal extensions. Right side, tray intact. Left side, retaining plate.

These two positions of the jaws associated with vertical dimension being determined and controlled by habitual muscular fixation, we are assured that, in the edentulous mouth, the mandible will assume the same positions in sounding the letter M and in deglutition as it

did before the teeth were removed. Therefore, to obtain the individual normal vertical dimension in complete denture prosthesis, we need only to record the position of the mandible in the foregoing positions.

Figure 1 demonstrates these different relationships of the lower anterior teeth to the upper, when the mandible travels from rest position to vertical dimension.

TECHNIC

The length of the upper bite-rim, composed of the artificial anterior teeth and rather wide posterior compound sections, is established in the usual manner. An all compound rim can be used, but replacement of the anterior section by the teeth is far superior.

The "recording trays" are locked in position on the "retaining plates." The lower base, of reinforced material (brown), is placed on the model. The under surface of one tray (this surface is greased to prevent it from sticking) and its plate are dry heated and sunk into the baseplate, parallel to and over the center of the ridge and as far back against the heel as possible. The tray on the opposite side is treated in like manner. (Fig. 2.)

In this technic, the anterior portion of the ridges are not to be considered in establishing normal vertical separation, and because it is desirable to have only the minimum amount of material to handle, no anterior lower rim is provided.

The baseplates are placed in the mouth and the patient is requested to close until the top of the side walls of one or both trays contact the upper rim. A line is scratched on the occlusal surface of the upper rim to denote the relation of the sides of both trays to the upper recording surface.

The baseplates are now removed from the mouth and the buccal and palatal sides of the upper rim trimmed to the marked lines; also V guide notches are cut in the center of the contact area, and this surface is coated with mineral oil.

The upper baseplate is placed in the mouth. Both trays are filled with an excess amount of uniformly soft compound and placed in the mouth, and the patient is requested to say M, M, M with the lips making slight contact. Both plates are then removed and the "minimum clearance" space record is chilled.

Since we desire to record the position of the mandible after full muscular contraction has been exerted by the use of the M sound, the recording material should be uniformly soft so that it will have no influence on the movement of the mandible in producing the sound. However, we must be sure that this soft recording material will not be distorted by the lips when being placed in the mouth, that it will "stand up" during the registration process and that it will be centered under the upper recording surfaces. This is all accomplished by use of the "recording trays."

The upper rim is placed in the lower record and the heels are examined for clearance. All excess compound is removed from the record, and the record is measured and its height above the ridge recorded.

The primary purpose of this step was to obtain a record the height of which is close to the individual normal vertical dimension, so that we would have only the minimum amount of material to deal with. From this record, we are also able to determine the amount of natural overbite and thereby establish the correct length of the artificial anterior lower teeth.

The upper base is now replaced in the mouth. The trays with the compound records are removed from their retainers and placed in the compound heater with water at 140° F.

After these records have become uniformly soft, they are reattached in their respective retainers. In order that this may be quickly done without touching

the soft compound, the trays are provided with buccal extensions.

The lower baseplate is placed in the mouth and the patient is instructed to wet the lips with the tongue and swallow. Owing to the subconscious control of the musculature associated with this action, the mandible is elevated to its normal vertical dimension.

Because the trays are removable, the "minimum clearance" record can be reheated in rather hot water without damage to the baseplate, and we are assured that both sides of the upper recording surfaces made simultaneous contact with the recording material at a point where the mandible was only slightly below its normal vertical dimension. We are also assured that the material was so uniformly soft that it would prevent any feeling of contact that might interfere with the necessary involuntary action or prevent the full contraction of the associated muscles. The side walls of the trays will confine the soft material, and we are assured that it will "stand up" and receive a sharp imprint of the upper recording surface, though the occlusal pressure created by deglutition is very light.

The bases are removed from the mouth and the record is chilled. If the record is penetrated by the tray, the upper rim is reduced and a new record is made. The height of this vertical dimension record is measured and recorded as in the minimum clearance record. This relation is also the unstrained functional centric relation and, as such, it is used to position the lower base to the upper, which has been previously mounted on the articulator with the assistance of a facebow.

In the majority of cases, they will be mounted in the correct relationship, but it is advisable that the relationship be checked in all cases, because we cannot always recognize those cases wherein the muscles associated with mandibular movements have adopted bad habits and incorrect behavior owing to occlusal or temporomandibular abnormalities.

To conserve time and be in a favorable position to make corrections, the following technic is used before the posterior teeth are set up:

1. The trays are removed with the records from the retainers.

2. The surfaces where the trays rested are oiled to prevent the compound from sticking to these surfaces. The tracer is mounted and the centric position checked.

3. If correction is to be made in centric relation, the lower baseplate is remounted and the tracer removed.

4. Records in the trays are reheated and another record is made on the articulator with the same vertical dimension, but in the new centric relation.

5. The lower anterior teeth are set to simulate the natural denture as recorded by the preextraction anterior centric relation record. Lacking a preextraction record, we can determine the approximate amount of anterior overbite, except in the open-bite cases (about 3 per cent), and thereby determine the length of the lower anterior teeth by subtracting from the measurements made in the first record (minimum clearance) the measurements made in the second record (vertical dimension) and deducting 1 mm. for the amount of anterior clearance. Overbite = "MC"—("VD" + 1 mm.).

6. To prevent interference during the examination of vertical dimension, the male part of the guide locks are cut to 1 mm. plus the amount of overbite. The remaining part designates centric relation and helps prevent dislodging the teeth when closure is made in protrusion.

7. Correct vertical dimension has been registered when the anterior teeth are the approximate length of the lip, and when the patient utters the hiss sound, there is only the minimum clearance space between the anterior teeth. This sound elevates the mandible to approxi-

mately the same position as the M sound, but differs in that it causes the lips to retract, instead of touching, allowing a clear view of the relationship of the anterior teeth.

Having accepted the arrangement of the teeth in artificial anterior centric occlusion, which should be very close to the natural arrangement, we are now in a position to register what we shall term the "incisal relation," a definite functional forward position of the mandible replacing the protrusive relation. The musculature associated with the incisal relation lowers the mandible beyond the anterior overbite, carrying it forward for the depth of the anterior overjet.

Exceptions to be noted: In extreme overbite, mandibular function is limited to an opening and closing movement and no incisal relation record is necessary. The same is true in the natural end-to-end anterior centric occlusion cases, as centric relation in such cases coincides with the incisal relation.

An accurate "incisal relation" record is obtained by making an approximate record (upper anterior teeth about 4 mm. directly above the lower incisal edges) on the articulator, removing the trays with the record; and after they are made uniformly soft in hot water, they are replaced on the baseplate and the patient is instructed to close on the "ends" of the front teeth.

SUMMARY

During the act of enunciating the letter M, a minimum clearance space is maintained between the natural anterior teeth and the position of the mandible is just below its normal vertical dimension. When deglutition is involuntarily performed, the mandible reaches its normal vertical dimension and the teeth are in centric occlusion.

In the edentulous mouth, because of the fixation of the controlling muscles and by habitual repetition, the mandible assumes essentially the same positions during the act of speaking and deglutition as existed when the natural teeth were present.

In complete denture prosthesis, it is imperative that we use a technic that will allow these acts to be performed in a natural manner without the patient's being conscious of our real objective, while clear cut records of two positions of the mandible are being registered.

A new technic of registration stresses the value of supporting detachable trays and indicates why two distinct steps are necessary to register the individual normal vertical dimension.

Repeated registration of the vertical position of the mandible in producing the M sound or in deglutition will produce records the height of which never varies more than 1 mm. This further proves that the mandible is controlled by habitual muscular fixation and also demonstrates the accuracy of the method of registration.

A dependable method is employed to check the accuracy of the registered vertical dimension, being also a definite check on the correct length of the artificial anterior teeth.

BIBLIOGRAPHY

GILLIS, R. R.: Establishing Vertical Dimension in Full Denture Construction. J.A.D.A., 28:430, March 1941.

SCHLOSSER, R. O.: Complete Denture Prosthesis. Philadelphia: W. B. Saunders Co., 1939.

SWENSON, M. G.: Complete Dentures. St. Louis: C. V. Mosby Co., 1940.

TENCH, R. W.: Interpretation and Registration of Mandibulomaxillary Relations and Their Reproduction in an Instrument. J.A.D.A., 13:1675, December 1926.

THOMPSON, J. R.: Cephalometric Study of Movements of Mandible. J.A.D.A., 28:750, May 1941.

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TRENDS IN AMERICAN DENTISTRY

By Oren A. Oliver,* D.D.S., Nashville, Tenn.

It is a signal honor and a distinct pleasure to be permitted to appear, as the representative of 50,000 dentists of the United States, before you who represent the American Dental Trade Association, to discuss some of the current trends as they are related to American dentistry. These trends, because they have direct bearing upon dental practice, are of interest to all members of your association. Never before in the history of this country have so many forces for rapid change been evident. Certainly, the beginning of its second century finds dentistry in a period unlike any it has passed through before. At the same time, courage is to be found in the present organization of dentistry, in dental education, in licensure and in the extent to which the problems in these fields are being studied.

Only a few days ago, I attended a meeting of the American Dental Association at Houston. At this meeting, and at others which were held in connection with it, many pressing problems were discussed formally and informally. Among these were rehabilitation and the various aspects of preparedness; public medicine; dental economics; national health programs, and postdefense or postwar problems. The Houston meeting reflected, as will perhaps this meeting, the desire to contribute to the national defense and, at the same time, prepare for what is likely to be a trying period of adjustment after the passing of the emergency. Closely associated with these two problems are those which have to do with dental health, a subject which, because of the findings of Selective Service examinations, is now being widely discussed. All three problems are of tremendous importance. I should like to discuss the last one first.

Selective Service examinations have shown that more than 20 per cent of rejected Selective Service registrants are rejected because of dental defects, and that between 8 and 9 per cent of all men examined are rejected because of these defects. That deficiencies in the number of teeth, dental caries, pyorrhea and other oral conditions are the principal causes of these rejections is a fact which immediately attracts attention and leads to inaccurate but startling claims that the dental conditions of men of draft age have grown steadily worse since the first World War. Since the physical standards of the 1917 draft, including those for dentistry, were changed several times, and at no time were they similar to those of 1940, it is not possible to arrive at any satisfactory decision as to whether dental health is any better or worse than it was twenty-three years ago. Neither can we compare existing findings with those of the Federal drafts of 1861-1865, for then the standards differed. What we do know is just what we have known for many years; namely, that dental caries is the most frequently occurring physical defect among our people. That this is true cannot be taken as an indictment of the dental profession any more than it can be taken as an indictment of society, or as proof that there has been inadequate financial support for research. Whatever one may

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suggest as a basic cause of existing conditions of oral health, the conditions exist, and interest in their elimination has been greatly intensified during the past year.

Dentistry has preached prevention for years and has advised control through frequent visits to the dentist. It has promoted children's dentistry, and, throughout the years, gradually expanded its efforts in dental health education. It now has more knowledge of prevention and control at its command than ever before. Of all countries in the world, it has the best restorative materials and technic. Yet there is great need for endowment of research and education; which more than any other measures can operate to reduce the incidence of oral diseases. This is the key to the situation, and let me remind you that it is a key which has not been tried adequately, for neither dental research nor dental education has ever received financial support commensurate with existing public needs.

The dental aspects of preparedness include plans for procurement of dental personnel for the armed forces while protecting communities by providing that there shall be no great loss in available dental service to the civilian population. The Committee on Dental Preparedness of the American Dental Association has at hand a great deal of information that will be valuable to this project. The Committee on Economics of the American Dental Association is now completing its studies as to the distribution of dentists in the United States, by counties, in order to determine as nearly as possible where dental service is the most or the least available and where dental personnel for the Army or Navy might be secured without depriving communities of what is thought to be an adequate supply of dentists. Another problem in this connection has been the maintenance of an adequate supply of dentists to keep up with population growth and the need for replacement in the profession of those who die or retire each year. Fortunately, dental students in good standing are being given deferment from military training until they have completed their dental courses. It is also fortunate that the general enrolment of dental students in the United States has increased 8.5 per cent over that of the last academic year. While it is obvious that enrolment should not for many reasons be allowed to be in excess of any possible future needs, it is essential that a normal supply of graduates be maintained.

In mentioning the enrolment of dental students in the United States, I am impelled to say that dental education in the United States, now largely under university control, is manifesting a dynamic approach to its problems. Dental school faculties are interested in achievement in the preparation of young men for dental practice, and have generally demonstrated a broad outlook and forward looking point of view. The dental schools of America and the profession are being ably assisted by the Council on Dental Education of the American Dental Association in the advancement of dental education in the United States. Carrying representatives from the profession, the licensure authorities and the dental schools, the Council on Dental Education is doing more to condition the future of the profession than almost any other agency except the schools themselves. The fact that discussion of the dental course is now rather widespread and vigorous should be taken only as an indication that dental education in America is not static or chaotic, and that the schools are investigating their problems and doing everything within their power to improve the quality of their training.

In the matter of the procurement of dentists for the armed forces in the event of war, the Government and the American Dental Association are faced

with a serious problem. The reason why this problem is of great significance lies in the fact that the distribution of dentists in the United States, like the distribution of physicians, is quite uneven. Some communities, especially many of the metropolitan centers, are overcrowded with dental practitioners, while many of the smaller centers are undermanned. In the event of war, it is important that dental personnel for the armed forces be drawn, as far as possible, from the overcrowded centers. Here, I might bring to your consideration the thought that the uneven distribution of dental practitioners may eventually be corrected to some extent by the flow of population away from cities into the many suburban centers which have developed along with the development of transportation facilities. I am of the opinion that this initial shifting of dental practitioners into smaller centers might be accelerated by guidance on the part of dental teachers, who could point out not only existing trends toward greater shifting of the population, but also the hazards which may accompany the establishment of practice in communities where there are too many dentists.

In the interest of conservation of time, it is necessary that I refrain from mentioning many of the varied and important aspects of dental preparedness. However, assuming that most of this audience is familiar with the points involved, I should like to consider for a moment the important question of preparation for the postwar period. Here, we have a problem almost as great as the problem of national defense itself. The demobilization of the armed forces and the workers in war industries, and the satisfactory adjustment which will be necessary after cessation of the emergency, will require that while we prepare for war, we must also prepare for peace. This we did not do in 1776, 1812, 1861 or 1917. Following those wars that occurred before 1917, our geographic frontiers were still open, and this fact plus other opportunities in a country which was expanding rapidly from both an industrial and a population point of view relieved us to a great extent of any postwar shock. However, after the First World War, we found out, much to our surprise, that compensating buffers no longer existed to any significant extent. This was true not only of the United States, but also of all other countries that had engaged in the first World War. Fortunately, the many ill effects of our failure to anticipate the problems following the First World War have been widely recognized, and, for the first time in the history of this country, government and other agencies are projecting their thoughts forward to a time when the emergency will be over.

Whatever plans may be made in preparation for the postwar period, there is one fact which we must recognize clearly: preparation for war and war itself are the outstanding conditions in any society. They dislocate our approach to living, to production, to education, so that we cannot say "business as usual." We operate at high speed, expanding our facilities, and accelerating our research activities, and draw to the fullest extent upon our capacities for invention, centering all of our activities primarily on the preservation of those principles of government under which we live. On the other hand, defense preparations and wars tend to force advances in technology, advances in the health service fields, and, in many respects, also tend to accelerate preexisting social trends. Therefore, we may not only speculate regarding the possibilities of unemployment and underemployment; but we may also, with some justification, anticipate that dentistry will be confronted by as much social pressure for change as was the case after the First World War. This pressure cannot be avoided; however, it can, in the public interest, and in the interest of the

dental practitioner, be controlled by judicious cooperative study and planning now and after the emergency. The problems involved are not simple and do not easily lend themselves to solution; but the American Dental Association, although it is an organization of dentists, has always been and is now fully conscious of its social responsibilities, and the members of the Association naturally hold the view that no group knows the dental problems of the United States, or is better able to advise and plan for improvement of the dental health of our population than is the organized dental profession.

The Board of Trustees of the American Dental Association recognizes both the immediate and the remote problems which this country is facing. This is also true of those committees of the Association which have to do with preparedness, education, economics, public health and national health programs. All recognize the force of new knowledge released under pressure of the emergency, and of the subsequent demand for new materials and new technics in prevention, control and treatment of oral diseases. The Association also recognizes the extent of public dental needs in this country and of the problem of meeting these needs to the fullest extent.

I say these things about the dental profession and the American Dental Association not in a bragging spirit, but because I want to point out that organized dentistry in America knows its position and its objectives; and furthermore, it is doing something about those objectives. That is only as it should be. In a most trying period for this country and its people, American dentistry is ready and willing to cooperate.

The members of the American Dental Trade Association know their collective and individual problems better than does any one else. However, we have, and always have had, many problems in common. Conditions that affect the members of your association are naturally reflected in private practice. At present, added pressure on the manufacturer has come from the increased demand for dental service created by accelerated business activities among industrial organizations now engaged in the manufacture of materials for war, in which workers must be kept at a high degree of physical efficiency. This need for a competent health service to workers in the war industries has increased the normal demand for dental service, and this demand has increased the need of the practitioner for equipment, materials and supplies. Reports reaching the Committee on Dental Preparedness indicate that the demand for civilian dental service has advanced far beyond the level of any previous period, and, as a consequence, a serious disparity has been created between the production and the consumption of dental materials. This sudden increase in the demand for civilian dental service calls for a readjustment of the supply and demand of operating facilities into which the dentist, the retailer and the manufacturer must enter. Cooperation between the American Dental Trade Association and the American Dental Association has always, I am glad to say, been excellent, and I am certain that it will continue to be so. There are problems now, and will be in the future, which make continued cooperation essential.

Again may I express my appreciation for the opportunity to be with you. As members of organizations, and as citizens, we have a job to do—a job of defending the principles upon which our democracy rests and of advancing the civilization for which those principles stand.

Medical Arts Building.

SURGERY'S PLACE IN THE TREATMENT OF PERIODONTOCLASIA

By ARTHUR H. MERRITT, M.S., D.D.S., Sc.D., New York, N. Y.

I

A disease, known by many names, involving and slowly destroying the osseous support of the teeth is referred to in the literature of many ancient peoples. It is a disease as old as and probably older than civilization. Many attempts at treatment have been made in the past. The earliest of these was some form of medication, usually without any understanding of the nature of the disease and, as might be expected, without success. With a few exceptions, this form of treatment continued down to the middle of the nineteenth century. Failure to accomplish more than a slight alleviation of symptoms led to the belief that the disease was incurable—a belief still shared by some.

About 1860, John M. Riggs, a practicing dentist in Hartford, Conn., claimed that scurvy of the gums, as it was then called, could be cured, and that its treatment was surgical and not therapeutic. His use of the term "surgical" has led to some misunderstanding, creating the belief that he employed surgical measures such as are in use at present. What he really meant was that its treatment was by instrumentation rather than by the use of drugs, which from time immemorial had been the usual treatment. Rigg's treatment was in the nature of curettement, crude and unscientific as compared with present-day standards, but his achieved results were markedly superior to those obtained by therapeutic measures. From that day to this, the operation initiated and taught by Riggs has, with many refinements, held the center of the stage. This operation, which has since come to be known as subgingival curettage, consists in passing an instrument—curet, plane or file—into the pocket and bringing it to bear on the surface of the root in such a way as to remove anything of a foreign or septic nature that may be upon it, leaving a smooth and polished surface. In pockets that are accessible and not too deep, excellent results are obtained in this way. Many still regard it as the operation of choice. It is, however, a difficult operation. To remove from a surface that cannot be seen whatever there may be upon it of a foreign nature is always an uncertain and in some instances an impossible operation. It has, moreover, another disadvantage. Unless reattachment occurs, which is the exception and not the rule, the pocket will continue, with the possibility of reinfection later. In non-cooperative patients and those not under constant supervision, this is a situation which needs to be seriously considered in deciding what form of treatment should be undertaken in a given case.

II

It is this uncertainty in cases fairly well advanced that has caused those engaged in the practice of periodontia to consider the possibilities of surgery. One of the earliest attempts at surgical treatment was made by a man named Kunstmann, who in 1772 published a small book setting forth the possible advantages of surgical measures. From the meager report of his operation, it seems to have

Read before the Section on Periodontia at the Eighty-Third Annual Meeting of the American Dental Association, Houston, Texas, October 30, 1941.

consisted of reduction in the depth of the pocket by removal of some portion of the gum tissue. Again, in 1894, a Hungarian dentist by the name of Robicsek advocated surgical treatment in the form of a flap operation by which access to the operative field was obtained without the removal of any part of the pocket. This operation was adopted by Zentler in this country and, as modified by Kirkland and others, has been rather extensively employed. Still another operation, consisting of the complete removal of the pocket, and advocated chiefly by A. W. Ward of San Francisco, is a third type that is being employed in the practice of periodontia.

It was perhaps only natural that those wedded to the more conservative practice of subgingival curettage should oppose the use of surgery in the treatment of periodontoclasia, especially since surgical measures in this field were in the experimental stages. Opposition was further increased by the belief, which had some justification, that surgical measures were employed when more conservative treatment would have better served the patient's needs. Out of this situation, there grew up two schools of thought, the conservative and the so-called radical. Neither understood the other. The conservative group knew little of surgery and its possibilities, and the so-called radicals had, as a rule, never mastered the technic of subgingival curettage. The upshot of this was that one group treated all cases by subgingival curettage, while the other employed surgical measures. Fortunately for all concerned, there has grown up a third group, which has mastered the technical procedures in both fields and, instead of using one to the exclusion of the other, is guided in its treatment by the nature of the case. This is as it should be. Surgery has as legitimate place in periodontia as it has in ophthalmology or rhinology. It is its abuse, not its use, that is to be deprecated.

III

Surgery, as indicated above, is applied to the treatment of periodontoclasia by different procedures, depending largely upon the case in hand and with due consideration of its esthetic effect.

The first surgical technic to be introduced into this country was the flap operation of Robicsek. This surgical procedure, limited very largely to the anterior teeth, consists in making a vertical incision at each end of the operative field, the separation of each septal gingiva to the bottom of each pocket, and the laying back of the labial flap in such a way as to gain access to the area being operated upon, plus visibility. A local anesthetic is used in all forms of periodontal surgery. The root surfaces are then curetted as in the operation of subgingival curettage, after which the gum flap is brought into place and sutured. Inasmuch as pockets in the incisor region are most frequently found to be on the lingual and the proximal areas at the same time that the labial surfaces of the roots are free from bone loss, the flap operation has a very limited place in the treatment of periodontoclasia.

A modification of this operation, making it applicable to the posterior teeth, is the division of each septal gingiva, the retraction of the buccolingual tissues so as to gain better access, the curettement of root surfaces and the subsequent suturing of the retracted tissues between each tooth operated upon. Both operations have the advantage of not exposing root surfaces, which may be sensitive and unsightly. The disadvantage is that the pocket may continue to exist and a possible reinfection occur later. For these and other reasons, the flap operation is in less favor than formerly.

The surgical procedure having the widest application in periodontia is gum resection. It is at once the most radical and the most effective. It has, however,

the disadvantage of exposing root surfaces which at first may be sensitive to thermal change and, if in the anterior part of the mouth, may, to some extent, be disfiguring. To overcome the latter disadvantage, the operation should, in most instances, be limited to the molar and premolar regions, consisting in removing all detached gum tissues to the level of the bone loss. The root surfaces are curetted, after which the entire operative area is covered with a surgical cement, which, with changes, is allowed to remain from two to four weeks. Following is a formula for a cement that will be found entirely satisfactory and that can be made by any druggist:

POWDER

Equal parts—zinc oxide and powdered lump rosin.

To 4 parts of the mixture, add 1 part tannic acid.

Measure by volume. Do not weigh.

LIQUID

Eugenol, 2 parts.

Sweet almond oil (not bitter), 1 part.

Melt a little powdered rosin in the eugenol, using a test tube, and heat very slowly. Pour into the almond oil and shake well. Mix to stiff paste and pack between teeth operated upon. Change every few days. Keep pack in place from two to four weeks. Use vaseline on fingers in packing between teeth.

If, when the cement is finally removed, the root surfaces are sensitive, silver nitrate should be applied in powdered form and precipitated with sodium thiosulfate or eugenol. If there is no etching of the root surface, there will be no stain that cannot later be removed. In the anterior part of the mouth, formaldehyde 40 per cent applied with an orange wood point and rubbed on sensitive areas will be found most effective.

In all cases treated surgically, there is little postoperative pain even in the more radical operation of gum resection. In the occasional case in which there is complaint of pain, the surgical pack should be removed and be replaced with another. This will give prompt relief owing to the sedative effect of the eugenol with which the pack is mixed. The importance of this pack cannot be overestimated. Without it, gum resection would be a failure. When packed between the teeth following resection, it protects the wound, promotes healing and prevents pain.

Sinclair[1] states: "Experience indicates that success in the surgical treatment of pyorrhea may be due primarily, if not entirely, to the surgical pack used." With this, I am in entire agreement. Unless there has been extensive bone loss, relatively little disfigurement follows resection. In many cases, six months after treatment there will be very little evidence of recession. By the application of surgery to the treatment of periodontoclasia, teeth which would otherwise have to be extracted can, in many cases, be restored to health.

Any one practicing periodontia should be familiar with surgical procedures and competent to employ them when indicated. One should be as conservative as possible in all cases. But he should not hesitate to employ surgical measures if, by so doing, better and more permanent results can be obtained. Postoperative care, balancing of occlusion, replacement of lost teeth, etc., must all be considered in the treatment of periodontoclasia by any method.

When these things are done, highly satisfactory results can be achieved even in cases considerably advanced. It should always be remembered, however, that periodontoclasia creates conditions which no amount of treatment can wholly repair. The loss of bone, recession of the gums, the weakening of the periodontium are all conditions that are irreparable. The lesson to be learned from this is the exceeding importance of prevention and early treatment.

580 Fifth Avenue.

1. SINCLAIR: *D. Items Int.*, 63:672, July 1941.

GIANT-CELL TUMOR (EPULIS) OF THE MAXILLA: REPORT OF A CASE

By Albert D. Davis, D.D.S., M.D., San Francisco, Calif.

WHILE the giant-cell epulis is the more common variety of tumors listed under epulis, the unusual size of the growth here described and its prominent location and late removal prompted this report.

The fact that the patient attended school during almost the entire growth period (four years) of the tumor in spite of the deformity produced in both jaws shows that there was no mental handicap as far as he was concerned. The mother, on the other hand, felt that this was some sort of punishment visited on her for her uncontrolled temper when she hurled a mixing bowl at her husband and struck the child by mistake. Her constant refusal of medical attention was due in part to religious scruples as well as to the fact that she believed herself to be still insufficiently punished for her error.

There has been no sign of recurrence of the tumor since its removal two years ago.

Fig. 1.—Appearance of patient prior to operation.

Fig. 2.—Appearance of patient prior to operation.

REPORT OF CASE

History.—The patient, a well-developed thin lad, aged 10 years, had a large red tumor projecting from the mouth. (Fig. 1.) Five years before, he had been struck forcibly in the mouth with a mixing bowl. One front tooth was loosened, and fell out about one week later. One month after this, the patient noticed a small, firm lump in the center of the upper jaw. This lump continued to enlarge. Six months later, the boy was seen by a physician, who recommended radium treatment, which was refused by the parents. The tumor was at this time about 1-1.5 cm. in diameter. The patient was seen in the plastic clinic, and it was recommended that the tumor be removed surgically. Up to that time, the boy had been going to school and about his business with a handkerchief or napkin tied about the face. The tumor had enlarged to the size of a billiard ball. It was painless and bled easily.

Examination.—There was a firm, nontender, meaty-looking tumor attached by a fairly broad base to the gum and maxillae midline, measuring approximately 12 by 14 cm. in circumference. The proximal third of its surface was covered with squamous epithelium. The remainder of the mass was covered with mucous membrane. The teeth

*From the Department of Surgery (Plastic Division) Stanford University School of Medicine.

in the upper jaw were displaced laterally from the midline and apparently the right central incisor was missing. The tumor was quite firm, being barely movable. The lower teeth had been pushed posteriorly along the entire lower jaw. Other findings were negative.

Operation.—Under intratracheal nitrous oxide-oxygen and ether, an incision was made on the right side of the base of the tumor (a mucosal flap over the base of the tumor was preserved for closure) and carried down to the bony portion of the base. A biopsy specimen for frozen section was taken here. The incision was carried completely around the base and the tumor removed. The maxilla was cut away with a rongeur as deeply as seemed necessary to assure complete removal of the tumor. The teeth were left intact. An area of tumor (?) and fibrosis on the anterior hard palate was dissected away. There was no gross evidence of abnormal tissue. The mucosal surfaces were approximated with No. o plain catgut. The patient withstood the procedure well, and was returned to the ward in good condition.

Laboratory Findings.—The microscopic sections showed a piece of gum covered by stratified squamous epithelium beneath which were masses of lymphocytes and broad fibrous areas composed of thin collagenous fibers. Deep in the tissue, there were a few spicules of bone surrounded by a great number of elongated cells with pale cytoplasm and oval nuclei. These cells were arranged in columns and whorls, and there were a few fibrous stroma. A moderate number of mitotic figures were seen. Scattered through the mass were many multinucleated giant cells with dark granular cytoplasm. The nuclei were often centrally massed and were not variable in size.

Diagnosis.—The diagnosis was giant-cell tumor (epulis) of the maxillae.

384 Post Street.

Fig. 3.—Appearance of patient five days after removal of tumor; showing deformity of jaws.

Fig. 4.—Appearance of patient five days after operation.

Fig. 5.—Appearance of patient two years after removal of epulis; showing improvement in growth of jaws.

Fig. 6.—Appearance of patient two years after operation.

SUGGESTIONS TO THE GENERAL PRACTITIONER FOR THE PREVENTION OF MALOCCLUSION

By Claude R. Wood, D.D.S., Knoxville, Tenn.

SINCE malocclusion can be defined as any deviation from normal occlusion that interferes with function, it is essential that dentists have a working knowledge of normal occlusion.

The first suggestion to the general practitioner for the prevention of malocclusion is that he determine whether the occlusion is normal, and if not, why. The reasons for deviation from the normal are many. While it is the duty of those who practice orthodontics to determine, if possible, the causes, the dentist should be able to inform the parents concerning the existing defects. The explanation should not be superficial because the case may develop into a serious deformity, and in that case the dentist is certain to come in for a share of the blame.

If a physician should say to a mother, "There is something wrong with this child's foot. It might be a good idea to see some one about it," but did not stress the importance of consulting a specialist, and if the mother did not follow the suggestion and, later on, the condition caused the child to become a cripple for life, would not the physician be held largely responsible? If he had explained to the mother the possibilities and probabilities arising from neglect and urged her to consult some one who would be able to correct the existing defect, how much more respect he would command from that patient in later years—even though his advice had not been heeded.

I have had many parents ask, "Why didn't my dentist tell me about this?" Sometimes, we can answer this to their satisfaction and somehow relieve the dentist of responsibility, but at times there is nothing that we can say to convince the parents that the dentist has not neglected the child. I know of many instances of a dentist's losing an entire family as patients because of his neglecting to call attention to a condition demanding orthodontic care. I recall the case of a girl 16 years of age who came to the office this week with a distinct anterior occlusion. She had been under a dentist's care since infancy, yet he had never mentioned this increasing deformity. All the lower anterior teeth were in a mesial relation to the upper teeth, causing difficulty in biting and chewing. The parents noted the abnormal condition and decided to go to another dentist, who immediately diagnosed the condition and advised that something should be done. The first dentist lost the entire family as patients. Never again will they have confidence in him.

I do not say that the dentist should be held responsible in all of these cases, since the parents will not always present the picture as it really exists. Often, their attention has been called to a certain condition and they disregard it until a more convenient time. Again, there may be evidence of neglect on the part of some one.

If a dentist does not want to assume any part of the responsibility, he should be fair to his patients and say: "I do not

Read before the Section on Children's Dentistry and Oral Hygiene at the Eighty-Third Annual Meeting of the American Dental Association at Houston, Texas, October 28, 1941.

know anything about this condition, as I am not interested in that phase of dentistry." There is no crime committed when a dentist says "I don't know." By so doing, he will, in most instances, instil confidence in his patients, and they will have a higher regard for him because they know that he is being honest with them.

I should like to go farther and suggest to the dentist that he should not lose interest in the case after referring the patient to the orthodontist, but should follow up these cases to see that they are receiving proper care. Some cases after treatment for a period of years are in worse condition than when treatment was started, which is all the more reason that a dentist should know something about these abnormalities and should see that his patients get the proper treatment. When we refer a patient to another man, we are assuming responsibilitiy. We should know that we are placing the patient in capable hands. The fact that the word "orthodontist" appears after a man's name does not mean that he is qualified. What is needed is a closer working relationship among all who practice the profession, to assure better service to the public.

When I was asked to give this paper, I consented because the subject of neglect had been impressed upon me by the many examples that I had seen in the past eighteen years. To be frank, I accepted in order to try to convey this message and plea, for this condition of negligence is not improving with time. The younger practitioner often seems to be the biggest offender.

But let me make myself clear. There are many practitioners of dentistry who do recognize normal occlusion and, I should say, abnormalities. And you here today, of such a progressive group as you are, are, I know, acquainted with these conditions. This message is voiced with the thought of leading you to carry it in your talks and presentations to groups of general dentists, and mainly in the hope of creating better working relationships among all groups of the dental profession for the betterment of the health of the children of our land.

I should feel that I had not carried out my assignment in accepting this invi-

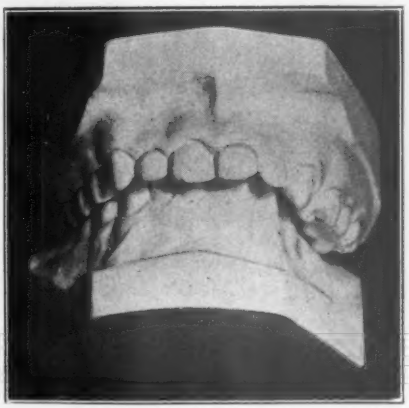

Fig. 1.—Complete lingual version of two premolars and first and second molars on left side of mandible; showing underdevelopment of mandible and overdevelopment of corresponding side of maxillae.

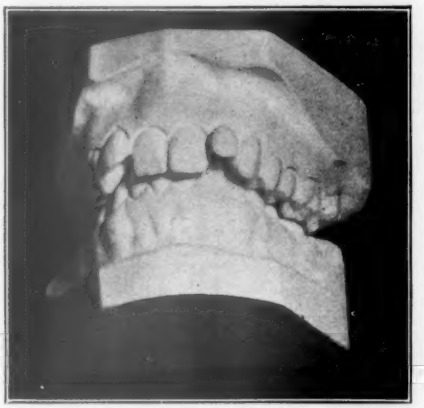

Fig. 2.—Lingual version of entire left side of mandible including both premolars and first and second molars, resulting in constriction of mandible, in patient aged 16.

tation if I did not treat the subject matter in a more scientific way than I have up to the present. In a more scientific approach, I should like to consider the subject from two angles:

1. Suggestions for the prevention of malocclusion.

2. Suggestions for recognition of malocclusion in the early stages in order to have measures instituted to prevent gross abnormalities.

On the first phase, "suggestions for the prevention of malocclusion," much has been written and many points outlined. I shall enumerate a few as a matter of review.

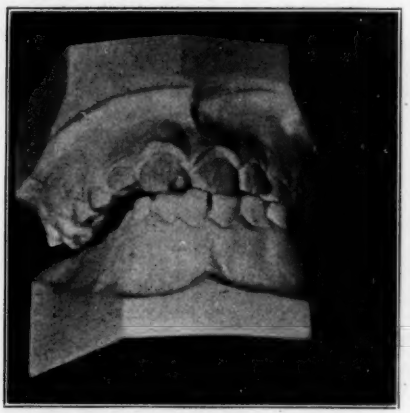

Fig. 3.—Complete lingual version of mandibular first permanent molars and deciduous teeth on right side.

1. Avoiding the too early extraction of the foundation teeth. This especially applies to the second molar. When this tooth is lost early, there is, in most instances, a drifting forward of the first permanent molar. Another error that I have noted is the extraction of a deciduous cuspid to make room for a lateral incisor that has erupted lingually. Often, after extraction in these instances, the lateral incisor comes forward into position, but occupies the space where the permanent cuspid was to erupt. This forces the cuspid to erupt entirely out of line. In this instance, the arch was too crowded to begin with, and extraction of the deciduous cuspid only aggravated the condition.

2. Avoiding delay in extraction of the foundation teeth. Delayed extraction of the deciduous teeth, which may cause irregularities in the second dentition, often occurs in the absence of normal root resorption of the first teeth, causing the permanent teeth to erupt too far lingually or buccally, and often making orthodontic treatment necessary.

3. The prevention of habits. This is an absolute necessity in some cases. The most frequent habits are:

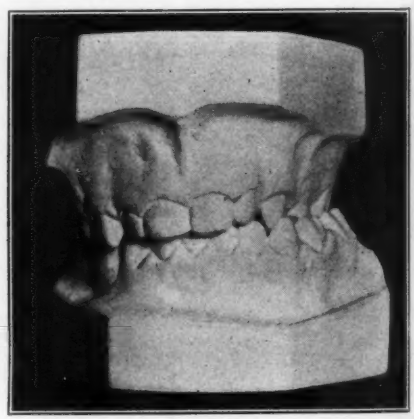

Fig. 4.—Complete occlusion of left maxillary cuspid and first and second deciduous molars in girl aged 4 years.

A. Thumb sucking. While thumb sucking is blamed for more orthodontic deformities than it actually causes, it can cause certain abnormal formations in the jaws and irregularity of the teeth. It is necessary that this habit be stopped, or even orthodontic interference will be of no avail.

B. Tongue habits. Tongue habits can cause an unbalanced condition of the teeth and jaws. A very frequent result is an open bite in the anterior part of the mouth.

C. Sleeping or pillowing habits, which can cause a distinct abnormality if persisted in.

D. Abnormal posture. This will cause an abnormal condition, especially resting the chin on the hands, if followed for a long period of time by the young child.

4. Proper diet. It has been shown conclusively that an improper diet disturbs the complete mechanism of the human body, and the teeth and jaws are no exception. Proper diet is a necessity for normal jaw growth and tooth development.

5. Maintaining space when teeth are missing. When teeth are missing, the other teeth usually drift into abnormal positions, different types of malocclusion resulting.

6. Removing supernumerary teeth. The presence of an extra tooth often causes complete disharmony in the relation of the maxillae and the mandible or a decided irregularity in either. This condition, while it does not occur frequently, does cause abnormalities that could be avoided if the disharmony were corrected in time.

7. Correcting abnormality of the frenum labium. This condition can cause malocclusion. It is not responsible for as many cases as are attributed to it, and its correction is not so often indicated. It should, however, be checked carefully and observed over a period of time to see that it does not cause an abnormal condition.

The second phase, "Suggestions for the recognition of malocclusion in the early stages in order to have measures instituted to prevent gross abnormalities," I believe to be of the greatest importance to the general practitioner, because it is this type of case that he comes in contact with most frequently; and he is usually the only guardian of health who does come in contact with this type of abnormality. He should be in a position to recognize it.

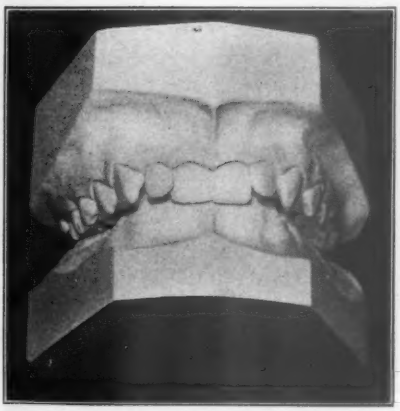

Fig. 5.—Deep overbite in boy aged 13, evident only on closure.

Fig. 6.—Lingual version of two premolars on right side of mandible in woman aged 25, permitting deep overbite with trauma of tissue in anterior part of palate.

I should like to enumerate a few simple suggestions:

1. Have a thorough understanding of normal occlusion.

2. Upon examination have every patient close his jaws so that the teeth in the opposing arches will occlude in the normal relationship. A point to remember is that the mandible in its most

distal relationship is in its normal position. From this normal closure, check the following points:

A. The relationship of the two arches: normal, mesial or distal. If teeth are missing, drifting of others will occur and this fact should be taken into consideration.

B. The occlusion, to see that the individual upper and lower teeth occlude normally.

C. The bite: normal, too deep, open or cross.

D. Habits which may cause discrepancies: tongue habits, lip habits, thumb sucking, biting habits.

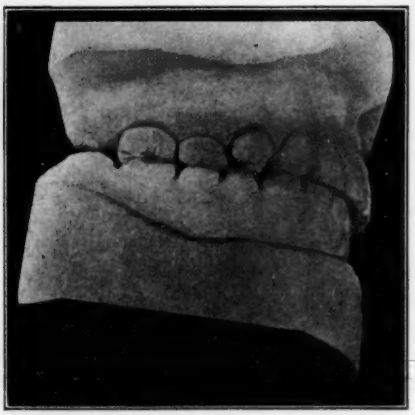

Fig. 7.—Maxillary right first premolar in buccal occlusion with mandibular first premolar because of retention of first deciduous molar, in boy aged 9.

3. Have the patient open the mouth so that a thorough check of the teeth and supporting structures can be made.

A. Note the contour and shape of the arches: constricted, underdeveloped, otherwise abnormal.

B. Check for missing teeth, making roentgenograms where indicated.

C. Check for extra or supernumerary teeth, making roentgenograms where indicated.

D. At the age of mixed dentition, check which teeth are permanent and which are deciduous. Often, a deciduous cuspid will escape notice and an impacted cuspid will be discovered too late for treatment.

E. Check alinement of the teeth: size, shape, relation to each other.

F. See whether the teeth are in proper relation to the alveolar ridge.

I should like now to show a few models depicting certain abnormal conditions. Some of these show rather advanced cases of malocclusion; others are in the early stages and are easily correctible.

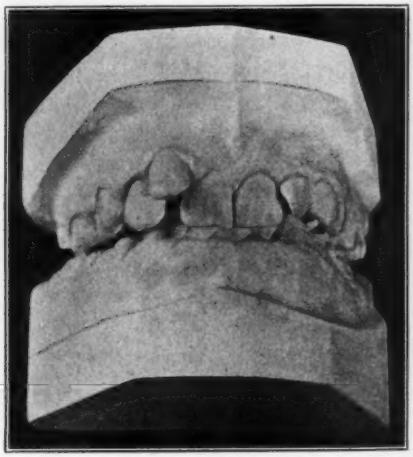

Fig. 8.—Complete collapse of maxillary arch with retrusion of central incisors and labial version of lateral incisors resulting from extraction of permanent teeth in boy aged 15.

Figure 1 shows the case of a boy 14 years old with complete lingual version of the mandible, left side, including the two premolars and the first and second molars. As shown, the entire left side of the mandible is underdeveloped, while there is an overdevelopment of the corresponding side of the maxillae.

Figure 2 shows the model of a patient 16 years old with a lingual version of the entire left side, including both pre-

molars and the first and second molars, resulting in a constriction of the mandible. Evidently, to relieve the overcrowded condition, a premolar was extracted in the lower arch. This resulted in a complete collapse of the maxillary teeth, with the resulting retrusion of the central incisors. This condition practically always occurs as a result of Nature's trying to establish a biting relationship for the anterior teeth.

Figure 3 shows the case of a boy 8 years old with complete occlusion of the mandibular first permanent molars and the deciduous teeth on the right side.

Figure 4 shows the model of a girl 4 years old with complete occlusion of the left maxillary cuspid and first and second deciduous molars. In this case, corrective measures were instituted for a period of six months, at which time normal occlusion was established and the appliances were removed. After two years, the case is continuing to develop in normal relationship with normal development of the maxilla on the left side. There is no question that if preventive treatment had been instituted in the three previous cases, they too could have been corrected very easily and would not have required prolonged orthodontic treatment.

Fig. 9.—Distinct mesial occlusion in girl aged 13. Decided overdevelopment of the mandible with corresponding lack of development of the anterior part of the maxillae was present.

Figure 5 shows models of a boy 13 years old. I referred to the necessity of having the patient close the jaws for a complete examination. Because of the deep overbite that this boy has upon closure, although the models when not in occlusion present a very nice alinement of the individual teeth, upon closure an entirely different condition is present.

Figure 6 shows models of the case of a young woman, 25 years of age, with lingual version of the two premolars in the mandible, right side. This allowed a very deep overbite, with resulting trauma of the tissue in the anterior part of the palate.

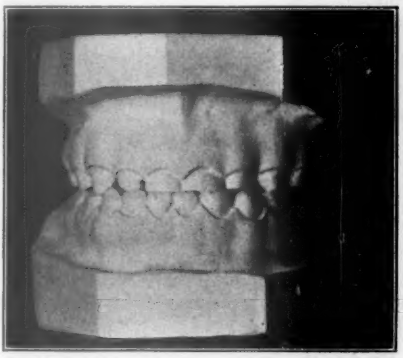

Fig. 10.—Case of girl aged 4 years, in which individual teeth and arches presented normal picture except on closure. The case was treated for six months and after three years seemed to be developing along normal lines.

Figure 7 shows models of a boy 9 years old with the maxillary right first premolar in buccal occlusion with the mandibular first premolar, evidently because of prolonged retention of the first deciduous molar. The same type of a condition started to develop in the second premolar region, but, on extraction of the second deciduous molar, the second premolar came into occlusion. In this particular case, after four months of

treatment, normal occlusion was established on the right side and all appliances were removed. The case seems to be developing along normal lines.

Figure 8 shows models of the case of a boy 15 years old. Again I should like to refer to malformations resulting from the extraction of permanent teeth, in this instance a mandibular premolar on the left side. As a result, we find a complete collapse of the maxillary arch, with retrusion of the two central incisors and labial version of the lateral incisors. The amount of drift of the lower teeth is evident on comparison of the median line above and below.

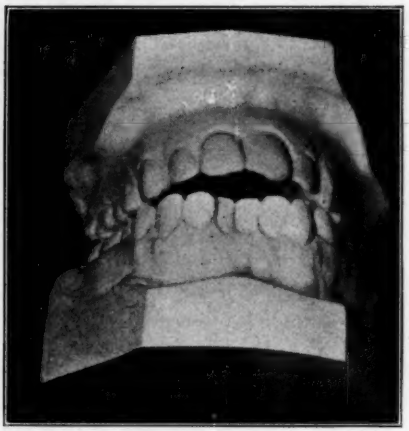

Fig. 11.—Typical results of thumbsucking evident in woman aged 25 years after habit was stopped.

Figure 9 shows models of the case of a girl 13 years of age with a distinct mesial occlusion. A photograph of this case would show decided overdevelopment of the mandible with a corresponding lack of development of the anterior part of the maxillae.

Figure 10 shows the case of a girl 4 years old. Upon examination of the individual teeth and arches, this case presented practically a normal picture, but, upon closure, another condition was evident. In this case, treatment was instituted for a period of six months. After three years' observation, the case continues to develop along normal lines. However, we cannot always be certain that this particular type of case will continue to develop normally. It should be watched and should be examined at intervals until the second dentition is completed. It is often possible, by a short period of treatment, to prevent a serious anomaly in later years.

Figure 11 shows the case of a young woman, 25 years of age, a typical picture of the thumb sucker. The habit was stopped years ago, but the result was as shown here.

Figure 12 shows the case of a girl 6½ years old, another case of thumb sucking. In these younger patients, the habit should definitely be stopped and treatment instituted so as to reestablish normal functional occlusion; also, to prevent the bad deformity shown in the previous picture.

Fig. 12.—Result of thumbsucking in girl aged 6½.

To cover the entire field that this subject presents would require a very long paper, as well as hundreds of slides depicting various conditions. The sole purpose of this presentation is to emphasize the importance of careful observa-

tion of each patient. The dental profession has a great responsibility, and we must meet it. It is our obligation to be fair and honest with the public. I am afraid that we are prone to forget some of these obligations. The "Doctor" before our names means a great deal more to the public than we at times realize. So let us be careful to uphold the title that we bear, and make the public feel that it can put its trust in us.

Medical Arts Building.

TREATMENT OF FRACTURES OF THE UPPER JAW

By JOHN B. ERICH, D.D.S., M.D., Rochester, Minn.

FROM the standpoint of therapy, no injuries affecting the bones of the face offer more intricate problems than do fractures of the upper jaw. The treatment of any fractures of the jaw has two objectives: first, reduction of the fracture in a manner not only to replace the fragments in their original position, but also to restore the teeth to normal occlusion; and, second, immobilization that will lead to a strong bony union of the fragments. In a case of fracture of the maxilla, the selection of the method or methods best adapted to attain both of these objectives requires a great deal of preoperative planning and frequently the preparation of rather elaborate appliances. Extremely helpful in determining the treatment most suitable in an individual case is a comprehensive knowledge of present-day operative procedures. Although a review of these procedures as described in the literature is both instructive and interesting, it also is likely to be somewhat confusing. One finds that different opinions are entertained in regard to the treatment of various types of fractures of the upper jaw, opinions which are indeed often completely contradictory.

The explanation of this situation rests in part on personal prejudice and partiality that prevent a proper estimation of the merits of various procedures. Then too, some methods described in detail in the literature deal not with the general, but with a particular, case. Moreover, every surgeon, through his own natural qualities, has instinctive methods of operating. A technic which is most efficient when applied by one operator may be rather unsatisfactory in the hands of another. Consequently, in considering fractures of the upper jaw, one cannot insist that his methods are superior to all others, but can merely present those procedures which in his experience have given the most effective results.

The treatment of any fractured jaw is successful only when the continuity of the bone has been established and the normal masticatory mechanism has been restored. The fragments of a fractured jaw may heal firmly by bony union, but the end-result is a failure if the original occlusion of the teeth has not been reestablished, to insure normal mastication. Nearly every fracture of a jaw in which there is the least displacement of the fragments causes some disturbance of occlusion, and unless the teeth can be brought into normal relationship, the

From the Section on Laryngology, Oral and Plastic Surgery, The Mayo Clinic.

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fragments will not be restored to their original position. Nothing serves as a better guide to the proper position of the fragments than does the occlusion of the teeth. Frequently, in cases of fracture of the jaws, it is almost impossible to determine by visual inspection of the mouth what relationship actually existed between the upper and lower teeth before the fracture occurred. This may be the result of the loss of many teeth in each dental arch or it may be due to primary malocclusion of the teeth. Consequently, the preparation of plaster study models of the dental arches will aid materially in determination of the original occlusion.

In general, then, the treatment of fractures of the upper jaw should be deferred not only until maxillodental roentgenograms can be secured, but also until plaster study models can be prepared. Only with such accessory diagnostic agencies can one accurately determine the best method of reducing the fracture and of immobilizing the fragments. Prior to the actual reduction of the fracture, débris and loose pieces of bone, which unquestionably would form sequestra, should be removed. Furthermore, I wish to stress the importance of extracting every tooth the root of which is exposed in a line of fracture unless the tooth is absolutely necessary for the fixation of a bony fragment. In my experience, the removal of such teeth is an extremely important step in the prevention of an abscess and possible osteomyelitis.

As a matter of convenience in discussing the therapeutic management of fractures of the upper jaw, I have found it advantageous to classify such fractures in four groups: (1) fractures which produce a complete separation of the upper jaw from the rest of the skull, (2) transverse fractures of the maxilla associated with one or more fractures of the palate, (3) unilateral fractures of the upper jaw and (4) simple fractures of the upper alveolar process. (Fig. 1.)

FRACTURES CAUSING A COMPLETE SEPARATION OF THE UPPER JAW FROM THE REST OF THE SKULL

It is advisable to consider three forms of fractures which produce complete separation of the maxillae from the rest of the skull. As illustrated in Figure 1, the first and most common type is the horizontal or transverse fracture of the upper jaw in which the greater portion of the maxilla is detached as a free segment. The second type, not infrequently encountered, is the pyramidal facial fracture (so-called because it assumes the form of a pyramid) which extends upward through each antrum to the ethmoid region and base of the nose. In this form, the loose fragment is composed of the entire maxillae and the nasal bones. Pyramidal facial fractures are often associated with a depressed or comminuted fracture of one malar bone. Of

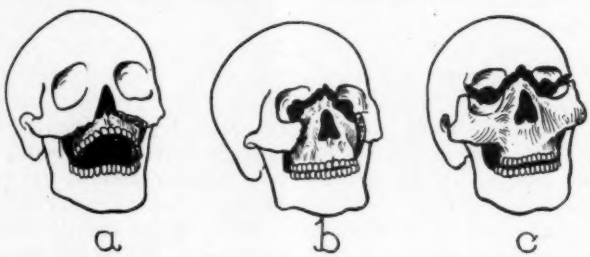

Fig. 1.—Fractures which produce complete separation of upper jaw from remainder of the skull. a, transverse maxillary fracture. b, pyramidal facial fracture. c, transverse facial fracture.

rare occurrence is the third type, which may be described as a transverse facial fracture passing through the base of the nasal and ethmoid regions and across the orbits to the zygomatic arches. This fracture is of such character that the upper jaw, malar and nasal bones constitute one complete displaced structure. As would be expected, the last type of fracture is extremely uncommon because it almost invariably is present in conjunction with depressed fractures of both malar bones, and, under such circumstances, the facial injury actually is converted into a combination of a pyramidal facial and a transverse facial fracture. One should not overlook the fact that

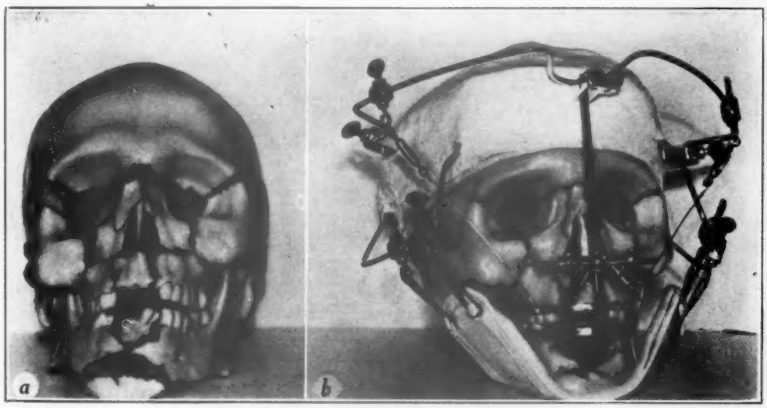

Fig. 2.—a, multiple fractures of facial bones including transverse maxillary fracture, pyramidal facial fracture and transverse facial fracture. b, fractures reduced and immobilized.

two or all three of these fractures may exist together in the same patient. (Fig. 2.) Moreover, fractures of the malar, nasal and ethmoid bones are frequently encountered in connection with severe fracture of the upper jaws.

Although the three fractures which have been described possess definite anatomic differences, the objective intraoral findings are often indistinguishable. Clinically, the upper jaw is loose and movable and more or less displaced so that the teeth do not occlude properly. However, in a transverse maxillary fracture, there is a tendency for the upper jaw to be forced upward and backward with a resultant open-bite type of deformity. Pyramidal facial and transverse facial fractures, on the other hand, are likely to cause a downward displacement of the upper jaw with varying degrees of malposition between the upper dental arch and the lower teeth. In such instances, roentgenograms frequently reveal a space several millimeters in width between the upper border of the nasal bones and the glabella portion of the frontal bone, and there is frequently an associated fracture of the cribriform plate of the ethmoid bone. It is not uncommon, in cases of fractures of the ethmoid bone, to find that cerebrospinal fluid drains from the nose for several days following the injury. Since cerebrospinal rhinorrhea is a sign of serious bony trauma in the ethmoid region and requires specific therapeutic management, its recognition in all cases of severe injury to the upper jaw or to the nose cannot be stressed too strongly.

In spite of the fact that the therapeutic management of the three types of fractures under consideration is essentially the same, their early clinical recognition through roentgenographic studies

is distinctly advantageous. By determining which one or combination of these fractures exists in each individual case, one can predict with a fair degree of accuracy the difficulty which will be encountered in the reduction of the fracture. In cases of pyramidal or a transverse facial fracture, reduction is usually a much more difficult task than in cases of a simple transverse maxillary fracture.

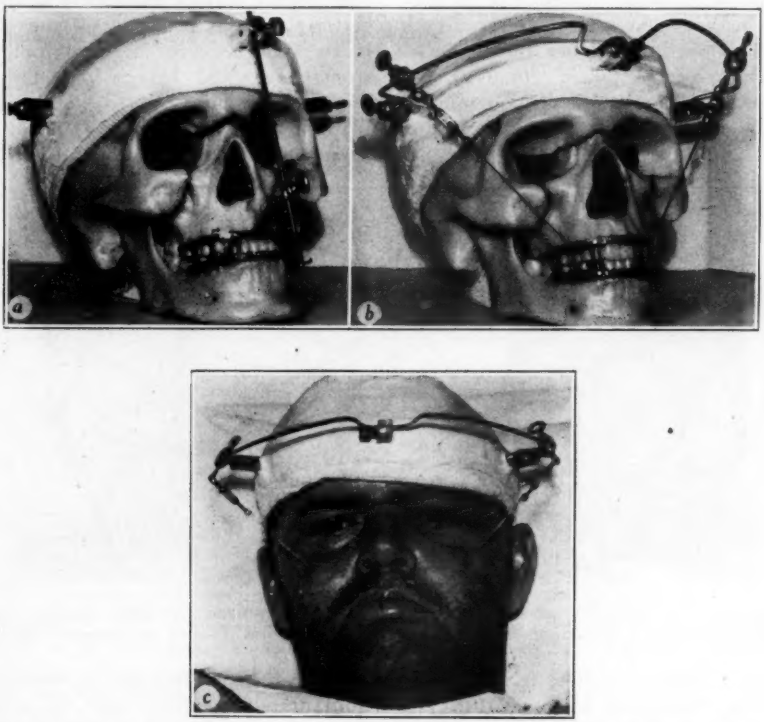

Fig. 3.—Reduction and immobilization of pyramidal facial fracture. a, traction with rubber bands bringing teeth into normal occlusion. b, turnbuckles attached to traction wires and hooks on head cast elevating loose fragment of bone; adjustable hooks on head cast preventing unnecessary scarring of cheeks. c, pyramidal facial fracture immobilized by traction wires through cheeks.

Furthermore, the preoperative diagnosis of the type of fracture present is of value in ascertaining the gravity of the injury, since fractures of the second and third type are frequently associated with fracture of the cribriform plate of the ethmoid bone, a complication that may lead to a fatal meningitis.

In treating fractures of the upper jaw associated with fracture of the cribriform plate of the ethmoid bone, any injury of the overlying soft tissues of the face should, I believe, be taken care of as soon after the injury as is feasible. However, it is extremely important not to treat the fractured facial bones for from ten to fourteen days after the injury because any manipulation of these bones may disturb the fracture of the ethmoid bone and induce meningitis. After this length of time, the fracture in the ethmoid region has become walled off to a

certain extent by fibrous tissue, and it is then safe to proceed with whatever measures are necessary to reduce and immobilize the fractured bones of the face. During the interval of from ten to fourteen days, it is well to give the patient one of the sulfonamide preparations as an aid in the prevention of meningitis.

As applies to all fractures, the treatment of injuries of the facial bone which are associated with a complete separation of the upper jaw from the rest of the skull consists first in reduction and later in immobilization of the parts involved. The reduction of these fractures, in general, is based upon mechanical appliances which restore the teeth to the normal and original occlusion. Even though the upper jaw is freely movable in most instances, it is not possible to manipulate it into correct position. On the contrary, one must depend upon traction with rubber bands to secure satisfactory reduction of the fracture and normal occlusion of the teeth. The gradual, continuous pull of rubber bands, when applied in the right direction, invariably will restore a displaced upper jaw to its proper position, whereas the ultimate result would be more or less of a failure if one attempted manually to replace the fractured maxillae in accurate alinement.

The reduction by elastic traction of the three types of maxillary fracture under consideration requires, first, the application to the upper dental arch of a hooked arch bar, which is wired securely to each upper tooth. (Fig. 3.) Next, a similar arch bar is wired to the teeth of the lower jaw. Then rubber bands stretched between the hooks of the upper and lower arch bars gradually pull the teeth into occlusion and, in turn, the upper jaw into proper alinement. If the maxilla is displaced backward, direct anterior traction becomes necessary in order to effect complete reduction of the fracture. (Fig. 3a.) This can be accomplished by stretching a rubber band from the upper arch bar to a rod attached to a plaster head cast. Such traction with rubber bands will give sufficient pull in a forward direction to bring the jaw into the desired position. In many cases of transverse maxillary frac-

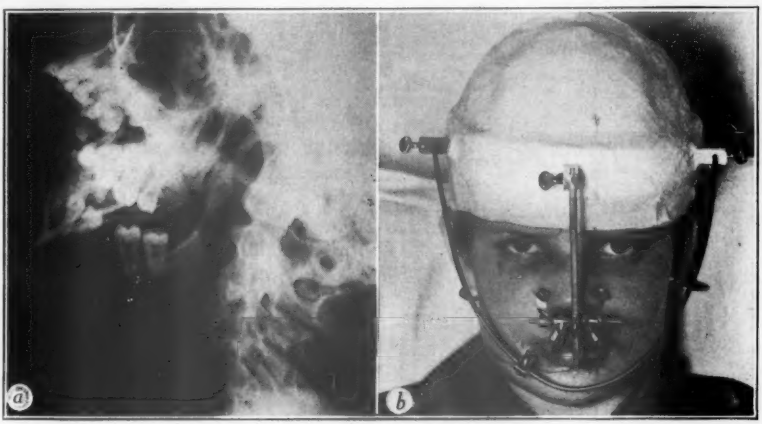

Fig. 4.—a, impacted transverse fracture of maxilla. b, fracture reduced by intermaxillary traction with rubber; additional downward traction gained by use of a strong rubber band (right angle of mouth) attached to upper dental arch bar and to curved rod fixed to plaster head cast.

ture, the upper jaw is displaced upward and backward to a marked degree, and very often the loose fragment is impacted in this position. (Fig. 4a.) Under such circumstances, strong downward traction is required to bring the teeth into occlusion. Here, a strong rubber band stretched from the upper arch bar to a curved rod, which passes downward anteriorly to the chin from the head cast, will give the desired downward pull upon the upper jaw. (Fig. 4b.) When the superior maxilla is displaced downward, its upward elevation can be nicely accomplished by the use of turn buckles. This phase of the reduction of these fractures will be considered later.

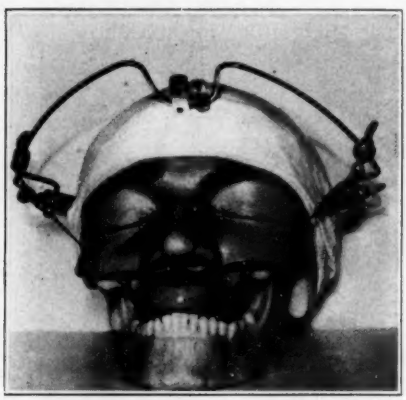

Fig. 5.—Immobilization of pyramidal facial fracture with edentulous upper jaw. Traction wires are attached to a vulcanite splint.

After the reduction of the fractured upper jaw and the restoration of normal dental occlusion, some form of immobilization becomes necessary to maintain the upper jaw in proper position until healing has occurred. For fixation, I have tried many methods which have been advocated in the literature, and I have come to the conclusion that I can obtain the most satisfactory results by the use of traction wires inserted through the cheeks as was first described by Federspiel. (Fig. 3b and c.) In the application of such traction wires, I employ two double strands of 26-gage bronze wire. Each strand is attached to the upper arch bar in the bicuspid region, passed directly through the cheek, and is fixed to a plaster head cast above. These traction wires permit a direct upward pull upon the upper jaw. They offer a form of immobilization which can be maintained for an indefinite period of time and which leads to a strong bony union of the maxillary fracture. When one employs traction wires which are attached to a fixed post on the head cast, there is a strong probability of producing in each cheek a linear scar, which may become retracted to form a dimple.

The explanation of such scarring is based upon the fact that a straight line between the upper arch bar and a fixed post on the head cap passes through the skin of the cheek at a very definite point. Since it is impossible for one to determine the exact position of this point, when the traction wire is inserted through the cheek, it usually emerges several millimeters away from the desired point. Consequently, when the wire is made tense, it pushes the soft tissues aside and the subsequent inflammatory reaction cuts through the skin to produce a linear scar. However, by the use of adjustable hooks attached to the head cast, I have been able to overcome this undesirable scarring of the cheeks. (Fig. 3b and c.) I employ two hooks, which slide from side to side upon a curved rod fixed to three metal posts incorporated in the plaster head cap. These hooks also can be made to swing anteriorly or posteriorly as desired. Through this range of movement, the hooks can be adjusted so as to engage the traction wires in any plane in which they emerge from the cheeks. This prevents any lateral pressure of the traction wires upon the soft tissues and, in turn, any tendency of these wires to cut through the cheeks.

Recently, I have found that the efficiency of traction wires can be materially increased by attaching a small turnbuckle to each adjustable hook. The purpose of turnbuckles is twofold: First, should the head cast tip forward a trifle, a simple adjustment of the turnbuckles will readily take up the resultant slack in the traction wires. However, of more or three successive days, the loose segment of bone, including the upper jaw, can be gradually elevated to correct position. (Fig. 3b and c.) In the few cases in which upward traction becomes necessary, the upward pull produced by turnbuckles can be supplemented by traction with rubber bands.

I would like to consider briefly the

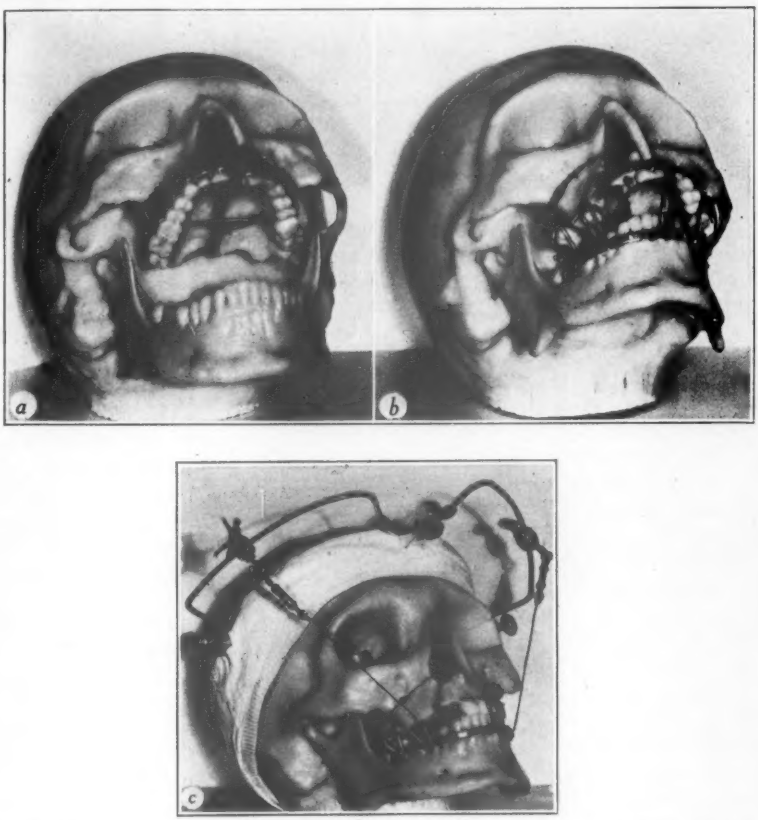

Fig. 6.—Transverse maxillary fractures associated with fractures of palate. a, median line fracture of palate. b, multiple fractures of palate reduced by intermaxillary traction with rubber bands. c, fragments immobilized by traction wires attached to lower arch bar.

importance is the value of turnbuckles in pyramidal and transverse facial fractures in which the maxilla is displaced downward. Here, by giving the turnbuckles a few rotary movements on two use of plaster headcasts, which many surgeons have discarded for some form of adjustable headgear that can be transferred from one patient to another. With such appliances, they are able to obtain

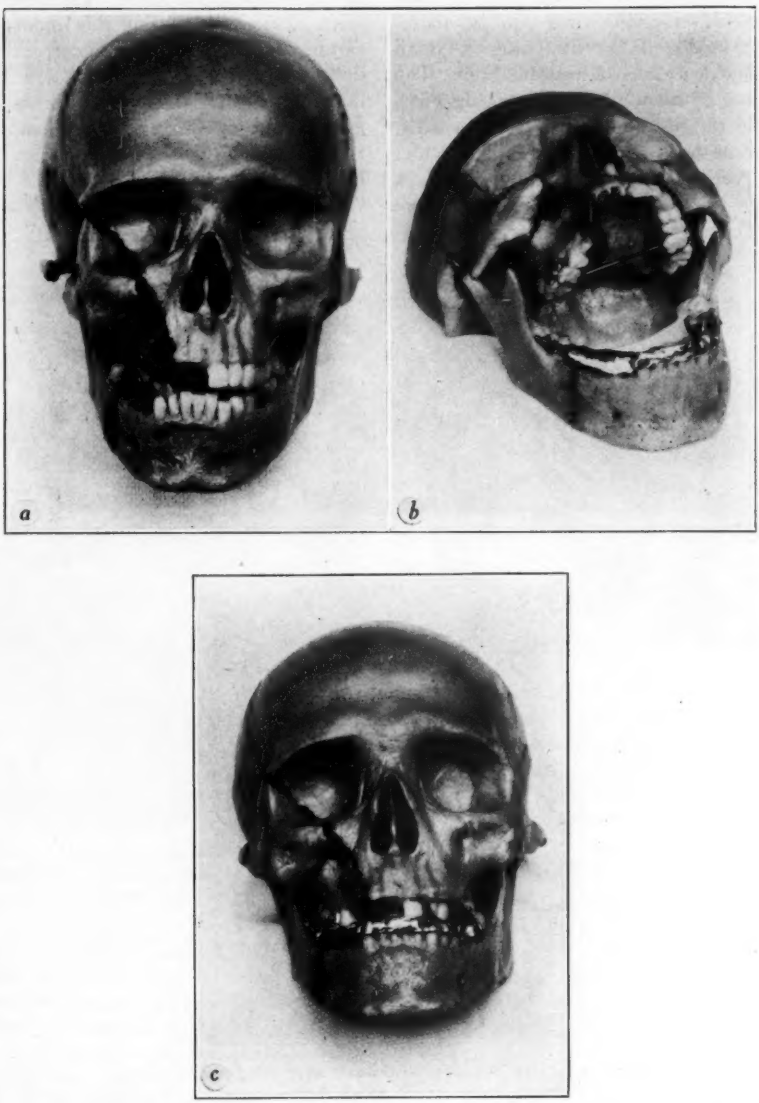

Fig. 7.—a, unilateral fracture of right upper jaw associated with depressed fracture of right malar bone and fracture of right horizontal ramus of mandible. b, cast silver splint immobilizing lower jaw fragments and spanning edentulous region of right mandible; fragment of upper jaw forced outward by means of a jackscrew. c, teeth brought into occlusion and fracture of upper jaw completely reduced by intermaxillary traction with rubber bands.

excellent results. However, in our practice at the clinic, it has been my experience that plaster head casts are more satisfactory, since, it appears to me, they are more stable over a long period of time.

In the construction of a plaster head cast, I follow, in general, the method described by Ivy and Curtis: A stockinet is placed over the patient's head, after which four strips of felt are applied in such manner as to cover the frontal prominences and parietal regions. These felt pads are retained in position by adhesive tape. If its upper end is left several inches long, the stockinet can be pulled down as a cuff to cover the felt pads. The next step consists in the application of a plaster bandage, which is adapted closely to the mastoid processes and which is carried down well over the occipital protuberance posteriorly and to the eyebrows in front. Incorporated in the plaster cap is a metal band (1 inch wide) to which three metal posts have been soldered. By means of set thumb screws, any of the appliances which we employ in the treatment of fractured facial bones can be attached securely to one or more of these three posts. To insure its thorough stability, it is important, I believe, that the head cap fit tightly over the mastoid processes. This can be accomplished by piling up several thicknesses of gauze over that portion of the completed wet plaster cast which covers the mastoid processes. Then if the gauze is bandaged in place for twenty-four hours while the plaster is drying, the head cast will become adapted perfectly to the mastoid regions.

I have found it desirable to relieve the head cap anteriorly when traction wires are employed because the latter tend to tip the plaster cast down, with the result that an undue amount of pressure is applied to the forehead. In order to relieve this portion of the head cast, I usually apply a strip of felt one-quarter inch thick to the forehead before the stockinet is applied. After the head cast has been completed, this piece of felt is removed, a space remaining between the cap and the skin of the forehead. By this procedure, any pressure sores or necrosis in the forehead region is obviated subsequently to fixation of traction wires in proper position.

Fractures of the facial bones, with complete separation of an edentulous upper jaw at times, offer considerable difficulty in reduction. It is not always possible to reduce such fractures completely, but this is usually of little consequence provided the upper jaw can be thoroughly stabilized to bring about a good bony union of the fracture line. It has been my experience in such cases that traction wires which are attached to the upper denture or to a vulcanite splint give very satisfactory immobilization for the maxilla and aid in securing the desired bony union. (Fig. 5.)

TRANSVERSE FRACTURES OF THE MAXILLAE ASSOCIATED WITH ONE OR MORE FRACTURES OF THE PALATE

When a transverse fracture of the maxillae is associated with one or more fractures of the palate, it is necessary that the fragments of the palate and alveolar process be brought into correct apposition before the upper teeth are returned to normal occlusion with the lower dental arch by elastic traction. The most common type of palatal fracture is the one which occurs in the median line. (Fig. 6a.) In cases of this type, I apply a hooked arch bar to the upper teeth and, subsequently, divide the arch bar at the site of the median line fracture. On each side, a hook is attached to each arch bar segment so as to emerge lingually in the interproximal space between the second bicuspid and first molar teeth. A rubber band then stretched between these two hooks will gradually bring the two halves of the palate and alveolar process into proper

approximation. (Fig. 6a.) One can then proceed with the reduction of the transverse maxillary fracture by the use of vertical traction with rubber bands, as has been described.

In multiple fractures of the palate, associated with a transverse maxillary fracture, there is often but a single tooth present in a fragment. (Fig. 6b.) When such a tooth is to be used for stabilization of the fragment, I believe that it is preferable to adapt an orthodontia molar band to the tooth rather than to apply a wire around the neck of the tooth. Such a molar band, when securely attached to the tooth, cannot be displaced and its buccal sheath serves as an excellent attachment for intermaxillary rubber bands or wires. Where there are several teeth in a fragment, it is preferable to employ a portion of an arch bar, wiring it to each tooth in the fragment. Then vertical rubber bands stretched from the upper molar bands or arch bar segments to a hooked arch bar below will gradually bring the upper teeth down into normal occlusion with the lower dental arch. Since there is no full upper arch bar to which traction wires can be attached, it is necessary that they be applied to the lower arch bar. (Fig. 6c.) This procedure firmly fixes the mandible, and, in turn, the fragments of the upper jaw are immobilized.

Reduction of a transverse maxillary fracture associated with one or more fractures of the palate is particularly difficult if the fracture is associated also with fractures of the mandible. The perplexing problem in the management of such fractures arises in the fact that there is no fixed point from which one can begin to reduce the fractures. Consequently, it becomes necessary to create a fixed point. Usually, I employ a cast silver splint to immobilize the fragments of the lower jaw and then, by intermaxillary traction with rubber bands, force the upper teeth into occlusion with the teeth of the lower dental arch. (Fig. 2.) In the construction of such a cast silver splint, it is necessary, of course, to take impressions of the teeth in each fragment and prepare plaster models from these impressions. The plaster models are then mounted upon an articulator in normal occlusion, after which the cast silver splint can be made. Although it is not always possible under these circumstances to establish the exact original plane of occlusion, the ultimate result invariably is satisfactory from both a functional and an esthetic standpoint.

UNILATERAL FRACTURES OF THE UPPER JAW

Usually, a unilateral fracture of the upper jaw is the result of a blow directed from the side and, consequently, the loose fragment of bone is displaced downward and inward. (Fig. 7a.) Moreover, such a fracture is commonly associated with a depressed fracture of the malar bone on the same side, and not infrequently with a fracture of the mandible and a loss of several lower teeth.

In many instances, it is possible to manipulate the loose fragment of the upper jaw into proper position and immobilize it merely by wiring the teeth in occlusion. However, in some cases, forceful reduction of the maxillary fracture is entirely unsatisfactory and special appliances for reduction and immobilization become essential. To reduce a fracture of this type, I usually employ orthodontic molar bands, attaching one to the upper first molar tooth on each side (Fig. 7b). A jackscrew inserted between these two molar bands will force the loose fragment of the upper jaw outward. Although such an appliance will push this fragment laterally, it will not correct the downward displacement. When the patient attempts to close his mouth, the teeth of this fragment come in contact with the teeth of the lower jaw, but an open bite is left on the op-

posite side of the mouth. To overcome this and force the loose fragment of bone upward into position, it is necessary to apply an arch bar to the unfractured portion of the upper jaw and a full arch bar to the teeth of the lower jaw.

Intermaxillary traction with rubber bands between these two arch bars will gradually close the open bite on the one side and, in turn, will force the loose fragment of bone on the opposite side upward into correct position. (Fig. 7c.) If the teeth of the lower jaw on the involved side are lost at the time of the injury, it is necessary to employ a cast silver splint, which is cemented to the teeth on the opposite side of the mandible. This splint is constructed with a saddle to fit over the alveolar ridge on the edentulous injured side of the lower jaw. The saddle serves as an occlusal plane on which the teeth of the right upper fragment can rest, when the latter is forced upward into position. If there is but one remaining molar tooth in the mandible on the involved side, as is shown in Figure 7a and b, the cast silver splint is so made as to span the edentulous region and possesses a lingual rest for the above-mentioned molar tooth. Such a splint can also be employed in cases in which the lower jaw is fractured as is demonstrated in Figure 7b and c. Here, the cast silver splint not only forms the desired occlusal plane for the fractured upper jaw, but also immobilizes the fragments of the mandible.

SIMPLE FRACTURE OF THE UPPER ALVEOLAR PROCESS

Simple fracture of the upper alveolar process requires no special consideration in this paper. If the periosteum of the loose fragment of the upper alveolar process is not completely detached, the fragment should be retained and immobilized by a splint or intermaxillary wires. However, if the roots of the teeth in such a fragment are exposed in the line of fracture, it is, I believe, preferable to remove these teeth and even the fragment of bone if necessary.

SUMMARY

Fractures of the upper jaw have been classified or arranged into four groups in accordance with their treatment:

1. Fractures which cause a complete separation of the upper jaw from the rest of the skull.

2. Transverse fractures of the maxillae associated with one or more fractures of the palate.

3. Unilateral fractures of the upper jaw.

4. Simple fractures of the upper alveolar process.

BIBLIOGRAPHY

1. FEDERSPIEL, M. M.: Maxillo-Facial Injuries. *Wisconsin M. J.*, 33:561-568, August 1934.

2. IVY, R. H., and CURTIS, LAWRENCE: Fractures of Jaws. Philadelphia: Lea & Febiger, 1931.

NEW SURFACES FOR UPPER DENTURES TO REST UPON

By Elmo B. Beeson, D.M.D., Seattle, Wash.

IN the search for a more satisfactory impression for upper dentures, I discovered a few facts definitely proving that all upper denture technics of the past have been founded upon false theories.

Up to the present, it has been considered ideal, in upper impressions for full dentures, to place the force used in masticating upon the alveolar ridges. The new surface impression takes all the force of masticating from the ridges and places it in other areas far better situated and better equipped to withstand it.

This paper will be divided into two parts. The first will point out some of the fallacies and weaknesses of muscle-trimmed impressions; the second, the advantages of the new surface impression.

Impression technics of the past have included relief of the pressure on the hard palate. This relief throws all the stress and pressure of chewing upon the soft cancellous bone of the alveolar process, and the soft cancellous bone, under this pressure, is resorbed more or less rapidly, according to conditions, and a change occurs in facial expression and inter-maxillary relationships.

The term "muscle trimmed" falsely implies that the limits of the denture cannot be extended beyond the limits of muscle action of the lips and cheeks.

In the old impression technics, the force of mastication tended to cause a lateral dislodging of the denture.

The buccal and labial flanges of present-day impressions do not fit closely the outer surface of the maxillary bones,

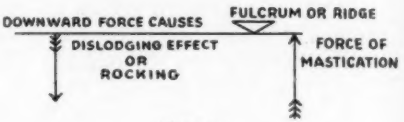

Figure 1.

and thereby lose much of their retentive potentiality.

In this new surface impression, the force of mastication, instead of being directed toward the alveolar ridge, has been distributed to other areas. These areas, instead of being soft cancellous bone which resorbs under pressure, are hard, compact bone which never changes. These new unyielding surfaces are far greater in area and far more favorably situated to resist the forces which tend to dislodge the denture.

The new surfaces, in relation to the forces of mastication, are divided into two classes. 1. Internal surface, composed of the hard palate. 2. External surface, the under surfaces of the zygomatic process of the right and left maxillary bones.

Why the hard palate, with its dense, unyielding surface, has been deliberately thrown into disuse by all impression technics of the past, it is difficult to understand. Soon after insertion of a new denture, the soft ridges of cancellous bone resorb, and the denture settles down in that area of hard bone which has been relieved. As a result of this relief, the denture surface no longer conforms to the shape of the hard palate, and an ill-fitting surface must carry the load of mastication. Surely, as long as the hard palate must of necessity carry the load

of mastication, it would be far better not to reduce the adaptation of the denture to the tissue.

This hard, unyielding, compact bone is the main foundation upon which this new surface impression rests. But, by extending the buccal and labial flanges far beyond the point where the muscle trimmed impression would stop, new areas of hard compact bone affording support are found. These areas, being external to the forces of mastication, tend to increase the stability of the denture many fold.

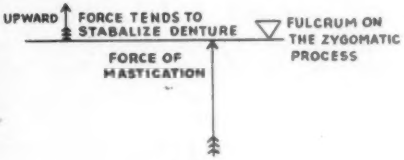

Figure 2.

To the dentist unacquainted with this radical departure from normal procedure, it always seems impossible that a patient could tolerate a denture built to bring pressure upon the under surface of the zygomatic process of the maxilla. This type of denture assures a much more comfortable foundation than has ever been possible with more limited areas.

This extension of the limits of the denture utilizes a principle in the Fournet-Tuller lower impression technic—the displacement of tissue. If it is possible below, why not above?

The misconception that muscular action will dislodge the denture or cause irritation supposedly has been fostered by the misnomer "muscle trim." The muscle trimming idea has resulted from a belief that there are muscles which can pull in a vertical direction against the flanges of the denture. It is peculiar but true that there are no muscles attached to the outer surface of the maxilla the direct action of which can dislodge an upper denture.

There are only two sets of muscles that are near the palatal surfaces of an upper denture. High in the incisive fossa are attached muscles which travel upward and the action of which in general is to depress the nose. Obviously, it would be impossible for these muscles to pull over the edge of the denture and force it down.

The only other muscles coming close to the flanges of the denture are over the tuberosity, where, high up, we find the origin of the head of the buccinator muscle. This muscle is inserted in the fascia at the corner of the mouth. Consequently, with one loose end, it cannot cause enough pull on the edge of a denture either to cause soreness or to have a dislodging effect. Hence, with no muscles to contend with, it becomes necessary to work only with loose connective tissue, which is easily, readily and comfortably displaced.

The principle of displacement of tissue for several years has been most successfully used by many dentists in Fournet-Tuller lower impression technics. For two years, I have utilized this principle in upper impressions in my own practice.

Among the advantages of the new surface impression are:

1. Elimination of lateral and anterior posterior rocking and dislodgement, due to the support given by external bearing surfaces.

2. Increase in adhesion between denture and tissue because of a more extensive surface contact.

3. Increase in suction, due to extension of the flanges and closer adaptation to bone surfaces.

4. Decrease in settling of dentures, due to the fact that bearing surfaces are not resorbed.

5. Support to the tissues, which improves the facial contour far beyond the possibility of old style dentures.

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THE X-RAY—AN ESSENTIAL TO DIAGNOSIS AND PROGNOSIS OF THE CHILD PATIENT

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ROENTGENOGRAMS, frequently referred to as x-ray films, have been known only since 1895, when they were discovered by William Conrad Roentgen. The health professions, therefore, have had the benefit of these shadow pictures for only forty-five years. As dentistry is one hundred years old, this profession has had access to roentgenograms for just the latter half of its short existence.

However, during this relatively short period, the roentgenogram has assumed a position of primary importance as an aid to diagnosis in dentistry. To many men, it has become a necessity in everyday practice. It should play an integral part in every complete dental examination. No diagnosis should be made until a full-mouth survey, including bitewing films, has been made. There are, however, many men who still do not fully realize the importance of x-ray films in the care of children. In presenting a paper on this subject, it is hoped that the men who are at the present time skeptical concerning the benefits derived from the use of x-rays may be convinced of their practicability.

This paper will consist of two parts. The first will present a few instances wherein the x-rays have proved valuable as an aid to diagnosis and prognosis. The second will present a preliminary report on the additional number of interproximal cavities which have been detected in children's teeth by means of bitewing roentgenograms.

One of the most perplexing problems with which a dentist can be confronted when working for the child of 9 or 10 years is that of deciding whether foundation (deciduous) molars should be filled, extracted or left alone. In a question of this kind, the physiologic or dental age of the child is of much greater importance than the chronologic age. There are many available tables, most of them based upon sound, scientific observations, which give the age at which the deciduous molars are supposed to be replaced. These tables cannot be dogmatically followed, since they are presented in terms of chronologic age and based upon general averages. The dentist must take into consideration the physical development of the child in attempting to determine the dental or physiologic age. Quite frequently, the chronologic and the physiologic age of the child do not correspond. In other words, a child may be chronologically, let us say, 9 years old, but he may be in advance of or behind this age physically. In such a case, x-rays should be resorted to as a basis for diagnosis. Bitewing x-ray films taken of each side of the mouth should be sufficient for a patient of this age.

In the study of the roentgenograms, the following points must be taken into consideration in order to determine as nearly as possible the physiologic age: (1) the presence or absence of the underlying bicuspid; (2) the position and root development of the bicuspid, and (3) the amount of resorption of the

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roots of the foundation molars. With a little concentrated observation of children and the consideration of these three points, one can soon judge fairly accurately by x-ray examination the time of exfoliation of the foundation molars. By comparison, then, with the chronologic eruption tables, one may easily determine whether a child is physically retarded, is average or is advanced.

Figures 1 and 2 are roentgenograms of a typical case. The patient was 9½ years old. Figure 1 is a bitewing film of the right side of the mouth.

From this roentgenogram, it can be easily determined that the lower second deciduous molar should not be filled because the tooth will be lost very shortly. The permanent bicuspid is present and lying just under the foundation molar. The roots of the molar are completely resorbed. If the foundation molar were lost at the present time, in all probability the bicuspid would erupt before the first permanent molar could move mesially to block it out. Therefore, in this particular case, the tooth should be removed in order that the mesial surface of the first permanent molar may be checked for decay. In the roentgenogram, a definite etching can be seen in the enamel of the first permanent molar as it approximates the second deciduous molar.

Experience has proved to me that etchings, even though seemingly shallow as shown in the roentgenograms, are frequently deep. This is particularly true when first permanent molars are involved. This might be accounted for by the greater density and greater buccolingual width of the first permanent molar over that of the deciduous molars. As the decay of enamel on smooth surfaces is in the form of a cone with its apex toward the dentin, it is conceivable that this radiolucent apex might easily become indistinguishable on the film owing to the superimposition of dense enamel which is located buccally and lingually from the actual decay. Therefore, it is essential to check the depth of the decay in the first permanent molar in Figure 1.

In the upper arch (Fig. 1), the distoclusal cavity in the first deciduous molar should not be filled, for, obviously, the tooth will soon be lost. However, the second deciduous molar still has good root formation and will probably be retained for the greater part of another year. In my opinion, a deciduous tooth having a cavity should be filled if the tooth has a favorable chance of remaining firm in the arch for six months or more. If this tooth were removed at the present time, the forward drift of the first permanent molar would probably close the space to the extent that the bicuspid could not erupt into the line of occlusion. The distoclusal cavity in the upper second deciduous molar, then,

Fig. 1.—Bitewing film of right side of mouth of child 9½ years of age.

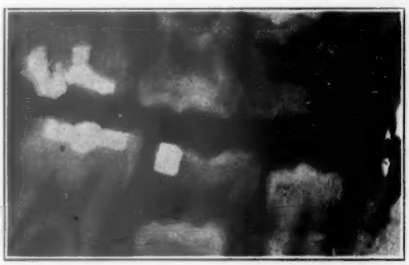


Fig. 2.—Bitewing film of left side of mouth of case in Figure 1.

should be filled. There is also a definite cavity in the mesial surface of the upper first permanent molar that should be restored. Thus, in Figure 1, the following course of treatment is advisable:

1. The lower second deciduous molar is removed and the depth of decay on the mesial aspect of the first permanent molar checked, a filling being placed if the decay has penetrated to the dentin, or silver nitrate applied if the decay has affected the enamel alone.

2. The upper first deciduous molar should not be filled. It may be removed or left to exfoliate normally.

3. The mesioclusal cavity in the upper first permanent molar and the distoclusal cavity in the upper second deciduous molar are filled.

Fig. 3.—Closure of space in child 8 years old.

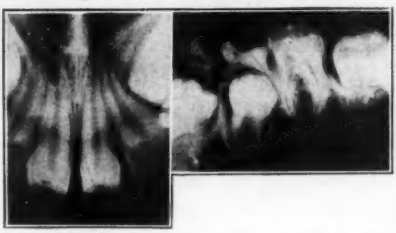
Figure 2 is the bitewing roentgenogram of the left side of the mouth of the case shown in Figure 1.

In the lower arch, the same procedure should be followed, since the same conditions exist. The lower second deciduous molar should be removed and the first permanent molar should be checked for decay. If this molar is not checked at this visit, the second bicuspid will probably have erupted into the arch by the time the patient returns for his next appointment, which may be from four to six months after his initial visit. The tight contact which may result will prevent an adequate visual examination.

Considering the amount of root resorption of the deciduous molars in the upper arch, if either of these molars need filling, it would be more practical to fill only the second deciduous molar. A diagnosis of interproximal caries cannot be made because there is an overlapping of the contacts in the upper molars. Another roentgenogram should be taken at a different angulation.

Overlapping of contacts in one arch is often encountered in bitewing roentgenograms. This is due usually to a slight rotation or difference in position of the upper teeth as compared to the lower teeth. To overcome this difficulty, two films taken at different horizontal angulations are usually necessary. On one film, the upper contacts should be taken, the possible overlapping of the lower being disregarded. On the second film, the lower contacts should be taken,

Fig. 4.—X-ray picture of shoe retainer supplying second deciduous molar when first permanent molar has not erupted.



A B

Fig. 5.—Typical Hutchinson's teeth (A) and mulberry molar (B) in congenital syphilis.

overlapping of the upper being disregarded. It is impossible to accurately diagnose incipient interproximal caries when there is overlapping of the contacts.

An x-ray picture is essential to determining the presence or absence of underlying permanent teeth in the arch. This is particularly necessary in early extraction of a deciduous tooth. If an underlying permanent tooth is present, a space retainer should be placed unless the child is in need of orthodontic treatment.

Fig. 6.—Lateral jaw x-ray picture of a 3-year-old girl having congenital syphilis.

Figure 3 is a roentgenogram of a girl 8 years old who was not treated in this manner.

The first deciduous molar was extracted one year before this roentgenogram was taken. During that year, the space completely closed, and the child now presents a definite orthodontic problem. This could have been prevented if a roentgenogram had been taken at the time that the tooth was extracted. Such a picture would have shown the necessity for a space retainer in order to keep the space open until the eruption of the underlying bicuspid.

An x-ray picture is also a necessity in diagnosing the need for and the preparation and setting of a shoe space-retainer, supplying the second deciduous molar when the first permanent molar is unerupted. By means of the x-ray, the presence of the second bicuspid could be determined, which would warrant the placing of a retainer. The location of the permanent molar must be known in order that the retainer may be made the correct length distally and the correct depth gingivally to engage the mesial surface of the molar. When the retainer is set, an x-ray film is needed to determine whether the correct position has been attained. It is also a good record of the calcification of the permanent molar and bicuspids with which later x-ray films may be compared. Figure 4 is an x-ray picture of such a retainer.

Not only will this type of retainer guide the first permanent molar into its correct position in the arch, but it will also maintain the space for the eruption of the second bicuspid and restore function to that side of the mouth.

In detecting late congenital syphilis in children, roentgenograms may be of extreme value, if taken early enough. Late congenital syphilis, as differentiated from early congenital syphilis, does not manifest itself in the infant, but affects the child some time during childhood or at puberty. A child who has this disease usually presents malformations of certain permanent teeth. Those most frequently affected are the permanent central incisors and first permanent molars. The central incisors, if affected, may present either of two typical malformations: the "screwdriver" crown or the notched incisal crown. The "screwdriver" central incisor appears as a tapering tooth, the incisal half of the crown usually being affected. The incisal edge is usually

very thin labiolingually. The notched central incisor appears as a rounded, but more normal-sized tooth. It presents a distinct crescent shaped notch in the incisal edge where normally the central lobe would be located. The dentin is usually exposed in these notches. These two types are known as Hutchinson's teeth. A third type, which is occasionally seen in conjunction with late congenital syphilis, is the peg or cone shaped central incisor.

The first permanent molars, if affected, usually present two typical malformations. One type has a somewhat tapered crown with the cusps definitely constricted as though the occlusal surface had been pinched together. The second

Fig. 7.—Unerupted Hutchinson's teeth in child 4½ years old.

type, which is fairly common, has a tapered crown, but the occlusal surface is covered with small nodules of enamel instead of cusps. This type of tooth is known as a "mulberry" molar, as shown in Figure 5 B.

Figure 5 A gives a typical picture of two central incisors which have been affected, the tapering "screwdriver" form and the thin incisal edge that has been fractured in several places. Figure 5 B shows a typical "mulberry" molar, which is small as compared with the unerupted second bicuspid or second molar. Although the deciduous teeth are rarely affected, Figure 5 B presents a case in which they have been affected. The child, aged 9 years, is congenitally luetic. The interesting thing about this patient is that she was sent to a doctor for a check-up when she was about 8 years old because her teacher had noticed that she could not see well enough to read. The physician diagnosed the trouble correctly and asked that he be permitted to examine a younger sister, who was also found to have the disease.

Since late congenital syphilis usually affects the permanent teeth, and since these teeth begin calcification very early in life, an x-ray picture of a patient 3 or 4 years old should reveal any malformations which might lead the dentist to suspect congenital lues. This would be extremely beneficial for a child affected with the disease, for the earlier the treatment, the more favorable the prognosis.

Figure 6 is a lateral jaw film of a 3-year-old girl who is congenitally luetic, showing hypoplasia of the deciduous molars and decided tapering of the unerupted molar. If a dentist should see a case of this type in his office, he would be perfectly justified in suggesting an examination by a physician; and he would be rendering the child a great service.

Figure 7 is the x-ray picture of a child, aged 4½ years, who also is congenitally luetic.

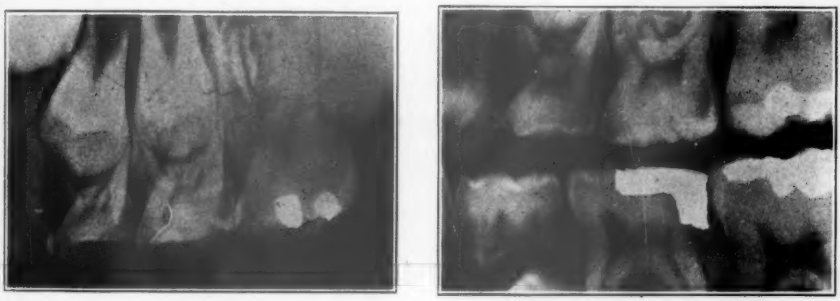
The unerupted upper and lower permanent central incisors are typical Hutchinson's teeth. The crescent-shaped notches are definitely visible in the incisal area of the upper central incisors and slightly visible in the lower central incisors.

INTERPROXIMAL ROENTGENOGRAMS

In detecting incipient interproximal caries, bitewing roentgenograms are decidedly a necessity. Frequently, in examining children, dentists will use a previously made full mouth roentgenogram to check up on interproximal cav-

ities. If this is done routinely, many cavities will be overlooked. Owing to the slighter degree of angulation of the x-ray cone when bitewing films are taken, many cavities are clearly seen in the bitewing films which are more or less questionable in the regular full-mouth films. This is shown in Figure 8. A is the regular x-ray picture of the right molar area, and B the bitewing x-ray picture of the same region.

Upon examination of film A, one would question the presence of decay on the distal surface of the second deciduous molar and the mesial surface of the first permanent molar. However, B shows plainly a cavity on the distal surface of the second deciduous molar and probably one on the mesial surface of the first permanent molar.



A B

Fig. 8.—Incipient interproximal caries. A, questionable caries. B, definite caries.

In order to ascertain the value, if any, of the bitewing x-ray examination over a thorough visual examination, a research experiment is being carried on in the Department of Pedodontics at the University of Iowa. The results, to date, are here presented in a preliminary report:

A definite procedure was followed with each child examined. A meticulous visual examination was made with mouth mirror and explorer in a dry field by one or both of two competent examiners who were designated to make all the examinations. All interproximal cavities which could be detected by mirror and explorer were charted upon a record sheet. At the conclusion of the visual examination, each child had bitewing films made of the molar area on each side. These were developed and examined. If there were overlapping contacts, other films were taken, until a good x-ray picture was secured of each side.

The visual examination record chart and the bitewing x-ray films were then compared by both examiners. All cavities and etchings visible in the x-ray films which had not been charted during the visual examination were noted. The child's name and the additional number of cavities and etchings were recorded as data.

Cavities were considered as those areas in which the decay penetrated the dentin as evidenced in the x-ray picture. Etchings were charted when the decay affected enamel alone. When the results are tabulated, cavities and etchings will be counted together.

There have been 210 children examined thus far, ranging from 3 to 12 years, with the mean, or average, 7.2 years. Of the 210 children examined, it

was found that sixty-eight, or 32.4 per cent, had no additional cavities. This does not necessarily mean that the child had no cavities at all, but that if cavities were present, they were all detected by the visual examination.

However, of 210 cases, it was also found that 142, or 67.6 per cent, did have additional cavities, which were all found by means of the x-rays. (Table 1.)

The chart, Figure 9, was made from the percentages in Table 1. The unshaded area shows the percentage of cases in which all cavities were found in the visual examination. The shaded area shows the percentage of cases in which additional cavities were found. From this chart, it can be seen that only one-third of the patients are adequately examined with mirror and explorer. Unless bitewing x-ray films are used in diagnosis, two-thirds of the patients leave the office with undetected cavities.

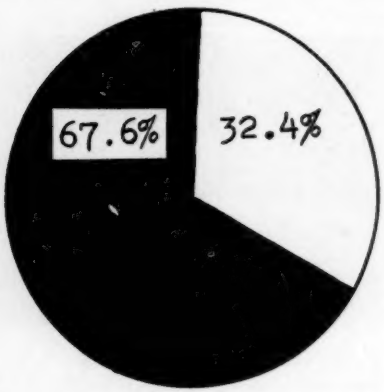


Fig. 9.—Percentage chart. The unshaded area shows the percentage of cases in which no additional cavities were found; the shaded area, the percentage of cases in which additional cavities were found.

Of the 67.6 per cent, or 142 cases, in which additional cavities were found, the total number of cavities found was 415. For a single patient, the additional cavities were from one to nine. Figure 10 shows the distribution of the children having the various numbers of additional cavities.

Figure 10 and Table 2 show the number of cavities and the number of children.

Figure 11 shows the case of a child 5 years of age in whom seven additional cavities were found. Only one cavity was found on visual examination.

TABLE 1.—DISTRIBUTION OF TOTAL CASES EXAMINED

	Number	Per Cent
Cases having no additional cavities	68	32.4
Cases with additional cavities	142	67.6
Totals	210	100

TABLE 2.—NUMBER OF ADDITIONAL CAVITIES AND NUMBER OF CHILDREN AFFECTED

Additional Cavities	Children
9	1
8	3
7	6
6	5
5	10
4	21
3	21
2	35
1	40
0	68

A summary of the data found in this study is as follows:

1. Age range of children, 3 to 12 years.
2. Number of children examined, 210.
3. Number of children in whom bitewing x-ray films disclosed no additional cavities, 68.
4. Number of children in which bitewing x-ray films disclosed additional cavities, 142.
5. Total number of cavities and etchings found, 415.

6. Highest number of additional cavities found in a single case, 9.

SUMMARY

The roentgenogram, known to science for only forty-five years, has attained an important position in dentistry as a diagnostic aid. In dentistry for children, there is definite need for more routine use of the roentgenogram, or x-ray film, in connection with diagnosis and prognosis. It has been found that in determining the dental age of a 9 or 10 year old child, it is necessary to have x-ray pictures. Furthermore, the presence or absence of underlying permanent teeth in the arch, in diagnosing the need for space retainers, can be determined only by use of the x-rays. It has also been found that late congenital syphilis, if affecting incisors or molars, may be detected by x-ray examination before 6 years of age.

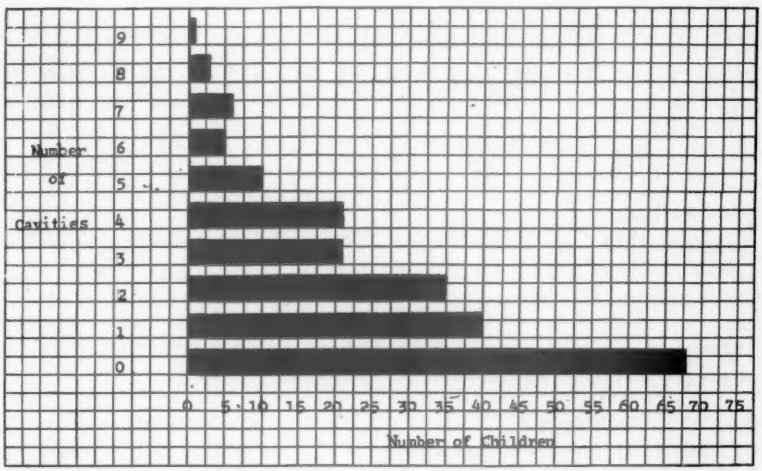


Fig. 10.—Distribution of children as to number of additional cavities.

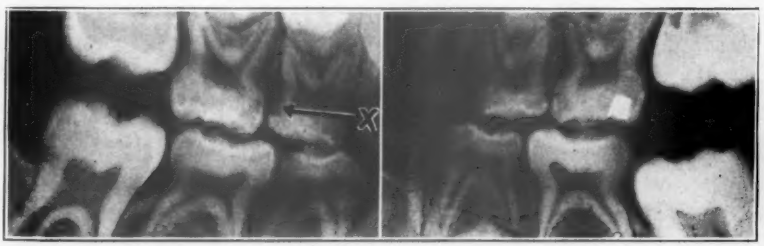


Fig. 11.—Bitewing x-ray picture of child 5 years old in whom seven additional cavities were found. X, cavity found by visual examination.

A bitewing x-ray examination is definitely superior to a thorough visual examination, since it has been shown that hidden interproximal cavities, which can be found only by means of bite-

wing roentgenograms, have been detected in two-thirds of all patients examined. These have been found to number from one to nine additional undetected cavities in each patient.

Bitewing roentgenograms, routinely, and full mouth surveys, as needed, should be made of all child patients in the dental practice.*

4009 McCorkle Avenue.

*X-ray pictures used through courtesy of the Department of Pedodontics, University of Iowa.

HUMAN DENTAL CARIES AND TOPICALLY APPLIED FLUORINE: A PRELIMINARY REPORT

By VIRGIL D. CHEYNE, D.D.S., Ph.D., Indianapolis, Ind.

SEVERAL publications have indicated in recent years the possibility that fluorine may be used in combating human dental caries. Studies concerned with animals[1] and those on human beings conducted by Dean *et al.*[2] have demonstrated that ingestion of food or drinking water containing the element is effective in limiting the destructive process, but it is not known whether the mechanism operates locally or systemically.

Most investigators of dental caries agree that the cause of this malady is the local disintegration of tooth substance by the liberation of acids by the action of bacteria upon food material in the immediate environment of the tooth. For that reason, it is logical to suspect that fluorine may act either directly upon the food and bacteria in the region of the tooth or it may increase the power of the tooth to withstand the dissolving action of the acids.

The work of Armstrong and Brekhus[3] demonstrated a high fluorine content of sound tooth enamel, indicating that an optimum amount of fluorine in the tooth substance confers properties which make the tooth more resistant to caries. Cox and his co-workers[4] demonstrated a reduced incidence of caries in rats' teeth forming during the period of maternal fluorine feeding. They suggested that an optimum amount of fluorine should be added to communal water supplies as a means of reducing dental caries in the human being. It should be realized, however, that such an approach would result in irregular fluorine dosage and might produce unexpected and obscure systemic disease. As yet, the systemic effects of an increased fluorine intake have not been adequately studied in human beings.

Although it is not very likely that a true metabolism of hard tooth tissue exists, it is of interest to note that reports have appeared which indicate that fluorine can be incorporated in enamel after the time of its formation. Perry and Armstrong[5] demonstrated that the fluorine content of the enamel of mature rat molars can be increased by adding the element to the drinking water of the animals after the teeth are erupted. It is their supposition that the fluorine

From the Department of Histopathology and Research, Indiana University School of Dentistry.

is absorbed through the enamel surfaces exposed to the water.

There is evidence in the literature that the uptake of fluorine by calcified tooth tissues may be due to a chemical interchange of elements. It is known that powdered bone will remove fluorides from water.[6] MacIntire and Hammond[7] showed that compounds similar to bone in composition will take up the element by an interchange of the hydroxyl of hydroxylapatite with fluorine to form fluorapatite. Because bone and tooth tissues are similar in inorganic composition, it is reasonable to presume that enamel and dentin of formed teeth can acquire the element if exposed to fluoride-bearing waters. The possibility of utilizing such an exchange in limiting human dental caries by the topical application of fluorine was suggested by Perry and Armstrong.[5]

The object of this report is twofold: first, to outline a method of fluorine application to human teeth *in situ,* and, second, to present the results of a clinical series of such applications in a group of human subjects. The procedure given is intended to afford the opportunity for tooth tissue to acquire fluorine in sufficient concentration to increase its resistance to dental caries without the attendant danger of systemic ingestion of the element.

METHOD FOR TOPICAL APPLICATION OF FLUORINE

1. All of the teeth are thoroughly cleaned.

2. The cleaned teeth are isolated with cotton rolls, one quadrant of the mouth being blocked off at a time.

3. The teeth in a quadrant are thoroughly dried with compressed air. Special care is taken to eliminate all moisture from the occlusal and interproximal surfaces.

4. The surfaces of the teeth are carefully wiped with a cotton pellet saturated with fluorine solution. The solution is "pumped" into the occlusal fissures of the molars and the interproximal spaces until all exposed parts of the teeth are thoroughly bathed.

5. The solution is allowed to remain in contact with the surfaces for at least two minutes, during which period the solution is carefully dried *in situ* with the air syringe.

6. A second application of the fluoride solution is made in the same manner. Approximately five to six minutes is consumed in these two operations.

7. The cotton rolls are then removed and discarded.

8. At least three rinses of the treated area are made with tap water before proceeding to another quadrant of the mouth. In order to prevent swallowing

NUMBER OF SURFACES AFFECTED IN DECIDUOUS TEETH EXAMINED

Examination	Number of Children	Average Interval Between Examinations in Years	Tooth Surfaces Examined	Total Surfaces with New Lesions per Child	Surfaces with Inactive Lesions per Child	Surfaces with Active Caries per Child
			Fluorine Treated Children			
Initial	27	0.28	1,450	3.09	2.04	12.85
Final	27		1,405		6.00	11.98*
			Control Children			
Initial	19	0.29	1,080		3.00	9.95
Final	19		1,045	6.04	3.55	15.44*

*These figures include the actively carious surfaces of teeth lost by extraction.

of the rinse water, the operator should hold the patient's mouth open until all of the water is expelled. This is an important precaution.

9. The remaining three quadrants of the mouth are treated similarly.

CLINICAL EFFECTS OF FLUORINE APPLICATION

Study Group.—In December 1940, forty-six children, equally divided as to sex, were made available for study by the Indianapolis Public Health Nursing Association. The children's average age was 5.52 years, ranging from 4.52 to 6.06 years. These children were from the underprivileged districts of the city and all showed active decay of the deciduous teeth. The parents stated that the children were born in the city and had lived there continuously since birth. Only one child had visited a dentist prior to coming to this clinic.

Twenty-seven of the children were placed in the experimental group for fluorine treatment and the remainder were retained as control subjects. All of the children received prophylaxis and an examination at the time of their initial visit. Prophylaxis and an examination were given at each of the subsequent visits, spaced at intervals indicated in the accompanying table. In addition, the teeth of the children of the experimental group were treated with approximately 1 cc. of a 500 parts per million aqueous fluoride solution ($KF.2H_2O$) at each of the visits.

Tabulation of Lesions.—The clinical examinations were made with a mouth mirror and explorer after the teeth had been carefully cleaned and dried. Each lesion discovered was carefully recorded as to extent of tooth surface or surfaces involved and given a numerical rating which indicated its carious activity. Roentgenograms were used as a diagnostic aid in the detection of cavities on the proximal surfaces. Approximately one-half hour was devoted to the examination of each child.

In order to determine whether the fluorine applications actually prevented formation of surface lesions, the number of tooth surfaces affected were recorded for each child at each visit. In an effort to detect any inhibitory effect of fluorine on the caries present, the lesions were rated as inactive or active, on the basis of macroscopic appearance and ease of penetration of the area by the explorer. Inactive lesions were those in which the explorer encountered hard tooth tissue and did not become engaged. Active lesions were those in which the explorer point always stuck in the cavity. Lesions or breaks in the tooth surfaces which were discovered or developed during the interval of observation, but remained hard, giving little or no evidence of progressive enlargement, were considered inactive. Lesions which showed clinical signs of dental decay at the time of the initial examination, but at the last examination gave every evidence of caries arrest, were eliminated from the active caries group. Teeth lost during the period of observation were all carious. The figure designating the total number of surfaces involved at the time of loss, however, was not dropped, but tabulated by being added to the actively carious surfaces recorded at the final examination. The present report includes data collected on the deciduous cuspids and molars. The results are mathematically interpolated on the basis of one year for ease of expression and comparison.

Results.—In the table, the number of surfaces affected in the deciduous teeth examined are summarized. From this table, it is seen that the number of tooth surfaces examined are fewer in the final than in the initial examination of the fluorine and control groups. This decrease indicates a loss due to the extraction of teeth. Because these teeth were carious, the number of carious surfaces

lost is maintained for purposes of tabulation and added to the figure designating the number of surfaces with active caries found at the last examination. The children receiving no fluorine treatments for the one-year period showed a total average increase of 6.04 new surfaces involved per child, while the children receiving treatments with fluorine during the same period developed an average of 3.09 new surface involvements per child. Almost twice as many new involvements occurred in the control group as compared to the fluorine group.

As to the activity of caries that developed during the observation period, it should be noted that those lesions which started in the teeth of the fluorine group did not become actively carious, whereas approximately 90 per cent of the lesions that developed in the teeth of the control group did become actively carious. Moreover, approximately twenty-four surfaces (0.87 surface per child) classified as actively carious in the fluorine group at the beginning of the experiment became hard during the one-year interval. The relative frequency of occurrence of lesions and the carious activity of such lesions in the teeth studied in the fluorine and the control group suggest that fluorine acts to prevent the initial involvement of these teeth as well as to retard their subsequent progressive destruction by caries.

SUMMARY

A clinical method has been devised whereby the teeth of human beings can be treated with fluorine *in vivo* without the attendant danger of systemic ingestion of the element. In determining the effectiveness of such a series of treatments in preventing the development and spread of lesions in the deciduous cuspid and molar teeth of a group of children, the data indicate that application of fluorine in the manner described acts more in suppressing carious activity in existing lesions. Moreover, the fluorine is effective in preventing the development of new lesions.

BIBLIOGRAPHY

1. MILLER, B. F.: Inhibition of Experimental Dental Caries in Rat by Fluoride and Iodoacetic Acid. *Proc. Soc. Exper. Biol. & Med.*, 39:389, November 1938.

2. DEAN, H. T., *et al.*: Domestic Water and Dental Caries Including Certain Epidemiological Aspects of Oral L. Acidophilus. *Pub. Health Rep.*, 54:862, May 1939.

3. ARMSTRONG, W. D., and BREKHUS, P. J.: Possible Relationship Between Fluorine Content of Enamel and Resistance to Dental Caries. *J. D. Res.*, 17:393, October 1938.

4. COX, G. J., *et al.*: Experimental Dental Caries. IV. Fluorine and Its Relation to Dental Caries. *J. D. Res.*, 18:481, December 1939.

5. PERRY, M. W., and ARMSTRONG, W. D.: On Manner of Acquisition of Fluorine by Mature Teeth. *J. Nutrition*, 21:35, January 1941.

6. SMITH, H. V., and DAVEY, W. B.: Development and Use of Bone Filter for Removing Fluorine from Drinking Water. Agricultural Experimental Station, University of Arizona, Tucson, Ariz., Tech. Bull. 81, 1939.

7. MACINTIRE, W. H., and HAMMOND, J. W.: Removal of Fluorides from Natural Waters by Calcium Phosphates. *Indust. & Eng. Chem.*, 30:160, February 1938.

DEEP INFECTION OF THE NECK OF DENTAL ORIGIN

By A. L. Beck, M.D., New Rochelle, N. Y.

INFECTION of the neck, when considered comprehensively, embraces many types and manifestations, depending on the portal of entrance and the subsequent pathway of its invasion. In a series of seventy-eight cases of neck infection[1] of all sources, seventeen cases (21 per cent) began with dental infection. Of these, six, which followed spontaneous extension, are placed in the unprovoked group. Nine followed dental extraction and one the filling of a cavity. Another resulted from accidental trauma to the gum when a stick was thrust into the mouth by a playmate. These eleven cases are placed in a group designated as provoked. All of the unprovoked cases were mandibular and produced the submaxillary region type of infection of the neck. Of the provoked group, all except three cases were in the submaxillary region. Of these three, one involved the zygomatic, temporal and pharyngomaxillary fossae, and was maxillary in origin. One involved both the pharyngomaxillary and the submaxillary regions, infection of the former arising from the use of the injecting needle in making the mandibular block, and of the latter from a mandibular tooth extraction. The third one, involving the pharyngomaxillary region contiguous to the internal pterygoid muscle, followed a lower molar extraction. The patient recovered without external drainage. Since writing this, I have treated a case which localized in the pharyngomaxillary space after the filling of a large cavity in the crown of the lower third molar, with spontaneous rupture into the pharynx through the tonsillar fossa. The trismus in this case was so extreme that the patient could not separate the teeth.

The great majority of cases of neck infection arising from the teeth or dental region follow infection in the mandibular teeth or region. The inflammation, when it advances, involves the submaxillary, submental and parotid regions and upper part of the cervical region adjacent to these triangles. There usually results the typical picture of Ludwig's angina.

Infection in the maxillary teeth and region may also be the cause of neck infection, in which event the type is very different. In such cases, the infection first involves the tissues contiguous to the outer surface of the maxilla, the cheek, spreading over the face, where it eventually involves the whole of one side to and involving the external ear, eyelids, forehead and temporal region. Simultaneously, there is extension posteriorly behind the maxilla into the zygomatic, sphenomaxillary and temporal fossae, where, if unchecked, there may occur abscess formation, sloughing and perhaps thrombosis of the pterygoid plexus of veins with, subsequently, extension to the pharyngomaxillary, or parapharyngeal, space, where there is also the possibility of blood-stream infection by way of the internal jugular vein. Infections from the maxilla extend backward by a pathway medial to the ramus of the jaw; therefore, when an abscess forms in the temporal region, it is to be found under and not above the temporal muscle.

These are the two principal types of neck infection that result from infection of the teeth and jaws. Infection arising from the anterior, or incisor, teeth of the maxilla may advance upward, involving the region of the nose; in which event, there is a possibility of involvement of the angular vessels with extension of the thrombosis into the cavernous sinus by way of the ophthalmic vein. This type is not a neck infection and therefore is not included in this discussion. It is not common. I have not yet seen this train of complications develop from dental infection, though it is entirely possible. I have, however, seen infection from the upper incisor region extend upward to involve the nasal interior and exterior. Thrombosis of the angular vein is then a possibility.

In a series of observed and analyzed cases, the following types of dental disease have afforded a portal of entrance for deep neck infection. They are divided into two groups: those in which infection advanced spontaneously and those in which the infection received the impetus of trauma from surgical intervention or accidental injury. The first is designated as unprovoked, the second as provoked.

UNPROVOKED GROUP

The unprovoked infections are:

1. Disease of the crown, caries, with involvement of the gingiva.

2. Disease of the root with involvement of the gingiva.

3. Involvement of crown and root with or without an apical abscess.

4. Pyorrhea alveolaris.

5. Infection of the gum, particularly that posterior to the third molar. A pocket here is often filled with infectious detritus.

6. Stomatitis of many varieties. This may be the precursor of neck infection, but till now I have not observed it without dental infection.

PROVOKED GROUP

The provoked infections are:

1. Infection following extraction, particularly when there is acute infection of the gum or alveolar process at the time. The majority of cases are in this category.

2. Infection introduced or activated by the injecting needle.

3. Infection following direct accidental trauma.

4. Infection following fractures of either jaw.

5. Infection of the maxilla with or without involvement of the maxillary sinus.

6. Gunshot injuries. These present unusual peculiarities, with perforating wounds, extensive laceration, comminution and loss of tissues.

PATHWAYS FROM THE TEETH INTO THE NECK

1. Infection may extend into the soft parts along the labial side. In the case of the maxilla, the roof of the mouth will not be involved. The infection advances into the cheek, face, eyelids, orbit, forehead, temporal region and external ear. It also extends backward behind the maxilla, medial to the ramus of the jaw, into the zygomatic, sphenomaxillary and temporal fossae.

In the case of the mandible, the floor of the mouth will not be involved, and the infection extends downward beyond the inferior jaw margin into the neck, and at first is superficial. Obviously, the cheek is also involved. In draining these, there is no need to penetrate the deep fascia attached to the margin of the jaw. There is little if any trismus, and that only as a result of irritation of the masseter muscle.

2. Infection may extend into the soft parts along the lingual side. In the maxillae, there is then involvement of the roof of the mouth. I have not seen neck infection along this pathway. In the case of the mandible, there is im-

mediate involvement of the floor of the mouth with marked trismus and a foul odor of the breath. In its advance, it then involves the entire base of the tongue, causing great swelling of the posterior two-thirds of this organ, thus crowding it upward against the palate and backward into the pharynx. With further extension, there is involvement of the epiglottis and then the entire larynx. The swelling and crowding backward of the tongue can be shown on a lateral view roentgenogram, taken with soft parts exposure time. It shows obliteration of the normal space between the tongue base and the epiglottis; i.e., obliteration of the valleculae. In other words, it will show the tongue base shadow in contact with the epiglottis shadow. Hoarseness and dyspnea are later symptoms, indicating involvement of the larynx, a dangerous complication. Previous to this, mastication and deglutition are difficult or impossible. As long as the infection remains above the mylohyoid muscle, there is no involvement of the neck, as this muscle sling separates the mouth from the neck. Abscesses localized in the mouth floor above the mylohyoid muscles may be drained by incision through the mucosa of the mouth floor. As soon as the infection penetrates the mylohyoid muscle sling by direct extension, by way of the lymphatics or by extension around the free part of its posterior border along Wharton's duct and the posterior part of the submaxillary salivary gland, it has involved the neck. At such a time, there is exhibited a typical case of Ludwig's angina, characterized by an extremely hard swelling of the entire upper part of the neck below the mandible, an intense cellulitis.

Fig. 1.—Example of infection from maxillae; neck incisions for drainage of pharyngomaxillary fossa and for preliminary ligation of external carotid artery.

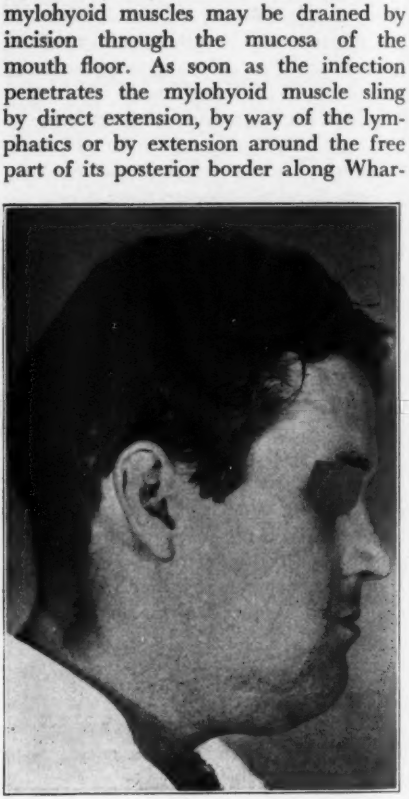


Fig. 2.—Ludwig's angina resulting from infection from mandible.

3. Infection may advance on both sides of the alveolar process, in which

event there would result a combination of the above-described involvements.

4. Infection may pass quickly through lymph channels directly into lymph nodes in the neck, and there cause abscesses without involvement of the intervening tissues. I have in former papers referred to this as a lymphatic jump. The nodes most frequently involved are those in the deep chain in relation with the carotid sheath just below the angle of the jaw. Those in relation with the submaxillary salivary gland are also frequently involved.

APPLIED ANATOMY

I here quote from a previous discussion of this subject[1]:

The applied anatomy of this region is interesting and important. The superficial layer of the deep fascia finds attachment above to the lower border of the jaw in the front of the neck. Laterally it covers the masseter, encapsulates the submaxillary and parotid salivary glands, and above, takes attachment on the zygoma. From these points it extends downward, and is firmly attached to the hyoid bone and thyroid cartilage. The lymphatics of the tongue, floor of the mouth and teeth of the mandible course downward toward the hyoid bone, above which they turn laterally and empty into the median upper deep cervical glands on the carotid sheath at about the level of the larynx, and, on the way, some of them drain into the nodes in relation with the submaxillary salivary gland. These, then, are the glands into which infection in these parts eventually drains. I have observed early internal jugular vein thrombosis in these cases of submaxillary region infection when drainage is delayed. The lateral course of the infection after it reaches the neck can therefore be explained on these two points, viz., the fascial attachments and the lymph drainage route. The mouth is separated from the neck by the mylohyoid muscle. Anteriorly and laterally this muscle sling is attached to the inner surface of the mandible. The lateral part of its posterior border is free. This muscle sling with its enveloping fascia is therefore part of a relative barrier to infection of the neck from infection of the teeth and floor of the mouth above it. Infection above it, in addition to penetrating it through the lymph channels and tissue spaces, passes backward and laterally around the free part of its posterior border. The submaxillary salivary gland is sometimes excised in draining such infections. Suppurative inflammation sometimes primarily involves the submaxillary salivary gland as a result of the presence of an obstructing calculus, either in the gland itself or in its duct. In such cases both the mouth floor and the neck, i.e., above and below the mylohyoid muscle sling, may be simultaneously involved. If the calculus is in the duct and can be removed, drainage through the duct or through the mouth floor will be effective often. If the calculus is in the gland the best remedy will be drainage or excision of the gland.

TYPES OF NECK INFECTION PRODUCED, WITH SYMPTOMS AND SIGNS

The types of neck infection have already been referred to under the descriptions of portal of entrance and pathway of infection. It remains to emphasize and to draw a word picture of the clinical manifestations.

Infection in the Mandible Region.—In the majority of instances, infection which gets beyond the teeth and alveolar process becomes a neck infection of the type of Ludwig's angina, as such involving the submental and submaxillary triangles and the upper part of the cervical region adjacent to these triangles. Most frequently, it occurs after a tooth extraction. Prior to the neck involvement, it involves the mouth floor and tongue. It originates in the teeth and alveolar process of the mandible. Most cases of Ludwig's angina are of dental origin, but sometimes the cause is not dental, the source being found in the floor of the mouth, salivary apparatus, base of the tongue or lingual tonsil, or perhaps in the tonsillar fossae,

1. BECK, A. L.: Deep Neck Infection. *Ann. Otol., Rhin. & Laryng.*, 48:940, December 1939.

especially where there are infected tonsil remnants. Where there is a lymphatic jump directly into the cervical glands, the typical Ludwig's angina does not occur, but a very different condition of localized cervical lymph node swelling takes place, which may or may not go on to abscess formation.

The typical Ludwig's angina presents a clinical history about as follows: Following a dental extraction, the socket does not become comfortable as in the normal case, but there ensues a distinct discomfort from an inflammatory reaction. This discomfort increases and, in from one to four or more days, becomes severely painful, with marked swelling and tenderness. As the inflammatory swelling and pain increase, there is involvement of the floor of the mouth, spreading to the tongue, which is pushed upward and backward, and, simultaneously, there develops a gradually increasing trismus.

At this time, it is still possible to visualize the fauces and oropharynx. Also at this time, the inflammatory involvement is still entirely above the mylohyoid muscle; i.e., entirely oral. Digital pressure upward and backward on the submental triangle below the chin is decidedly painful in the mouth, though there is not yet swelling of the neck. As soon as there is involvement of the base of the tongue, any functional movement of the hyoid bone or passive movement by digital palpation is painful. Mastication also becomes difficult and painful. If, at this stage, there is localization and the abscess or abscesses can be drained through the alveolar process or mouth floor, recovery will often take place without involvement of the neck by further extension. If, however, termination of the infection does not take place at this point, the infection penetrates the mylohyoid sling and invades the neck. This takes place rapidly, and all symptoms and signs are now greatly intensified. The oral involvement is greatly increased, so that it is no longer possible to visualize the fauces and pharynx because of the extreme trismus. This may be so extreme that the patient cannot separate the incisor teeth more than one-eighth inch, if at all. The tongue is greatly swollen and crowded upward and backward against the palate, and on its sides can be seen indentations of the contacting teeth. Chewing is impossible. This and the trismus are regarded as due chiefly to involvement of the internal pterygoid muscle. Salivary and mucoid secretions accumulate in the pharynx because of inability to swallow. Even breathing may be difficult because of the displacement of the tongue into the pharynx. The whole mouth floor, particularly the ridges along the salivary ducts, is greatly swollen with edema, rising up to or beyond the level of the free borders of the teeth.

A lateral neck roentgenogram will now show the shadows of the tongue base and epiglottis in contact. The neck in the submental and submaxillary triangles and the adjacent upper cervical region will now be greatly swollen and extremely hard. It is an intense cellulitis, the appearance of which is decidedly characteristic of Ludwig's angina. In fact, unless this is present, it is not a typical case of Ludwig's angina. No lymph nodes can be felt in the area. It has almost a bony feel. At this stage, edema of the larynx is likely to occur, announced by dyspnea, which may shortly go on to asphyxia, if not relieved. When it is severe, tracheotomy will be necessary to restore the airway.

While all these local manifestations are taking place, the patient is becoming very ill. Fever develops as soon as the oral soft parts are involved. In my experience, the temperature in these cases has been between 101° and 106°, and, at first, continuous or sustained. Often, as soon as the infection reaches the neck, there is a sharp chill and a severe sepsis

has developed. The pulse rate is increased. There is apt to be sweating, both day and night. This nearly always follows a chill, but may occur without chills. If more than one definite chill, with a sudden rise of temperature, occurs, it may be considered that a blood-stream infection impends or is present. One chill does not necessarily indicate blood-stream infection, but it should be regarded with strong suspicion. Daily abrupt rises and falls in temperature indicate blood-stream infection, especially if accompanied by chills.

With the disinclination and, later, the inability of the patient to swallow, dehydration occurs, and unless fluids are supplied by subcutaneous or intravenous administration, the condition becomes alarming. There is an increased loss of fluids and of salt from the profuse sweating, and these must be supplied in adequate quantities. The blood count will disclose the usual picture of infection. There is leukocytosis, the count going as high as 40,000. There is an increase of polymorphonuclears, the percentage going as high as 95. There is an increase of young forms of the polymorphonuclears, the percentage going as high as 50 or more. In the beginning, the eosinophils disappear from the blood count. Later, if the infection lessens, they return. An increase of monocytes is said to indicate improvement. Later, there usually develops more or less secondary anemia, manifested chiefly by a reduction in percentage of hemoglobin. The red cell count is also somewhat reduced. The anemia will be greater in the presence of the hemolytic types of organisms. Transfusions are very valuable for treatment of the anemia and are also valuable in small, frequently given amounts to increase resistance and minimize sepsis. They may be given as often as every two or three days in amounts of 200 cc. to 400 cc. to an adult. An adult patient requires at least 3,000 cc. of fluids per day. Routinely, 5 per cent glucose in a normal saline solution is used. As soon as a patient develops a definite severe sepsis, drainage is usually indicated. Delay is dangerous.

This description would not be complete without mentioning the disease in the mandible; viz., the alveolar suppuration and osteomyelitis. The latter does not always occur. If in one or two weeks after neck drainage has been established, there does not occur marked subsidence of pain, tenderness and swelling in the region of the mandible, osteomyelitis should be suspected. Immediate roentgenograms of the mandible should be obtained, not for the purpose of demonstrating sequestra, but for comparison with future roentgenograms.

Roentgenograms taken at this early stage will not show sequestration, but they may show some osteoporosis in areas where later roentgenograms show sequestration. In my experience, osteoporosis was disclosed during the second week, and osteomyelitis with sequestrum formation two weeks later.

The problem of which teeth should be removed, and when, must always be solved in these cases. It has been our custom to remove any tooth the roots of which are in intimate relationship with frankly suppurating areas. The local drainage will be much more effective after such teeth are removed. Even if it is possible, without undue risk, to preserve such a tooth, there is strong possibility that it will emerge from the disturbance devitalized. In my opinion, the risk of not removing it is greater than the gain. This is particularly true in osteomyelitis with loss of bone by sequestration. The chief aim should be free drainage at all points. This question of removal of teeth is still quite controversial in the literature. The saving of a few teeth is a small matter for boasting. It may be said that because many patients have recovered from severe illnesses without the benefit of blood

transfusion, there is no reason to conclude that blood transfusions are not necessary and beneficial. Once osteomyelitis with extensive sequestration exists, mastication is to be avoided because of the possibility of pathologic fracture. At this stage of the illness, the inflammation in all localities except the dental region and mandible has almost or wholly disappeared. Drainage of the involved part of the mandible should be maintained until the last sequestrum has come away or been removed surgically, after which healing will be so rapid that drainage may be discontinued. It is my custom to treat this stage of sequestration conservatively, waiting until the sequestrum has been completely cast off from the healthy bone. It is not always necessary to make new and extensive incisions for its removal. In most instances, the drainage opening already existing will suffice, though it may be necessary to enlarge it somewhat in accordance with the size and location of the sequestrum. It is amazing how quickly the wounds heal after the last sequestrum has been removed. In the management of osteomyelitis, the nutrient vessels of the bone should receive the utmost consideration and respect, and injuring them should be scrupulously avoided.

It should not be necessary to plead for timely and adequate drainage in these cases, but I feel constrained to do so because I know of a case resulting in the complete loss of the body of the mandible which may be ascribed to failure to observe this policy. Subsequently, the gesture of treatment of a septic and cachetic ambulatory patient by the roentgen rays obviously could not prevent a fatality. The most frequent cause of death is septicemia. Edema of the larynx is also of frequent occurrence, leading to asphyxia if not relieved. Hemorrhage from eroded vessels also sometimes occurs.

Infection in the Maxillary Region.—Infection in the maxillary region presents an entirely different picture, infection, as in the case of the mandible, most frequently following tooth extraction. Instead of the normally rapid, painless healing of several days, there develops a persistent discomfort, soon to be followed by pain and swelling involving the gingival tissues and, in a few days, extending into the soft parts of the cheek. There is then some elevation of temperature. Sometimes there will be a spontaneous recovery, sometimes not, but instead a progressive involvement of the whole side of the face and head including the external ear and also the eyelids, nose and temporal region, and extending downward to and beyond the jaw margin on the neck. Simultaneously, the infection travels backward behind the maxilla to the sphenomaxillary, zygomatic and temporal fossae, and upward in the region of the apex of the orbit and sphenomaxillary fissure. Before such extensive involvement has occurred, there has developed a well-marked sepsis, and the patient is very miserable and ill. The eye fundi should be constantly observed in the early stage before it is too late to separate the eyelids. Vision should also be carefully checked. A neuritis of the optic nerve will result in more or less loss of vision from subsequent optic nerve atrophy. Impairment or loss of function of one or more extraocular muscles is also a possibility. It should be remembered that a patient will not complain of double vision when the lids of one eye are swollen completely shut. Orbital abscess is another possibility, though I have never observed it from this cause. As stated previously, as the infection progresses, there may be extensive sloughing or necrosis deep in the anatomic fossae mentioned, especially in the temporal fossa. In reaching such an abscess for drainage, it is necessary to penetrate beneath the temporal muscle. An approach through the temporal muscle will reach not only an abscess in the temporal fossa, but also more deeply

in the zygomatic and sphenomaxillary fossae.

In one of my cases, the pathologic progression took place so rapidly that when drainage through this approach was finally decided upon, it was considered advisable and necessary to first ligate the external carotid artery in the neck below the area of involvement in order to avoid probable severe hemorrhage in the necrosed tissues. Leisurely and unharassed exposure of the abscess cavity can then be made without hemorrhage. Ligation of vessels in the necrosed tissues may be an extremely difficult or an impossible procedure, to say nothing of the risks. A comparatively bloodless field is to be highly desired. If the pharyngomaxillary fossa is also involved, as indicated by the evidence in the throat, this must also be drained. The best approach is the submaxillary, as described by H. P. Mosher. If there is a blood stream infection, and an internal jugular vein ligation must be carried out, this fossa may at the same time be drained at the upper end of the same incision. Obviously, when these deep areas are the seat of severe infection, one must consider the possibility of thrombosis of the pterygoid plexus of veins. If this occurs, thrombosis of the cavernous sinus is a probability, in which case the outcome is usually fatal.

In the presence of these severe suppurative infections, arteries may become eroded or necrosed, with hemorrhage the severity of which depends upon the size of the vessel involved. In the case of veins, there may also occur erosion or necrosis of the walls, but there is usually no hemorrhage because there is simultaneous thrombus formation. I have seen these long thrombi even where the vessel walls had completely disappeared by disintegration. I have seen later stages of this, following mastoiditis, in which the thrombus was also completely absorbed and the vascular sheath transformed into a sausage-shaped pus sac. Massive hemorrhage from the internal carotid high up may rupture through the pharyngeal wall into the throat, and there have in the past been numerous fatalities. Ligation of the common carotid artery with drainage of the abscess is here necessary and is often an emergency procedure. Hemorrhage from the temporal or internal maxillary arteries or their branches requires ligation of the external carotid artery. With these vascular complications, a dangerous sepsis is to be expected. Supportive measures including transfusions, chemotherapy and administration of fluids are urgently required. Meningitis is more apt to follow this type of infection than the Ludwig's angina type. Osteomyelitis, which is frequently present, will usually be found in two areas, the maxilla in the region of the primary dental infection, and the bones forming the zygomatic and temporal fossae of the skull.

Osteomyelitis of the maxilla is usually not the severe fulminating, spreading type that is found on the cranial vault. It is more or less localized in the alveolar process at the point of dental infection, spreading upward and involving the neighboring bone which forms the wall of the maxillary sinus, in which event there will also be infection of the sinus. When there is a persistent foul odor with subsidence of inflammation in the soft parts, this should be suspected. Operative treatment of such a sinus infection may be delayed until the involvement of the soft parts and the sepsis have been controlled. Teeth with apical abscesses or having a relation to alveolar abscesses should be removed. It is my custom to remove them when the soft parts are drained. Osteomyelitis of any of the bones forming the cranial vault is a much more serious condition. It is apt to become very extensive because of the mode of its advance by thrombophlebitis through the venous channels of the bone, which are a rich network of communica-

tion between the extracranial and intracranial venous systems. In this type of osteomyelitis, areas widely separated from each other by intervening areas of uninfected bone are produced. Extensive operations requiring the complete removal of both tables of the skull well beyond the visible pathologic condition are the only effective means of controlling such involvements. The frontal bone is particularly vulnerable to this severe fulminating type of osteomyelitis. The entire cranial vault may at last be invaded by piecemeal extension. In this type, there is always involvement of the dura, and epidural and subdural abscesses are common. Cerebral abscesses may eventually develop. Generalized meningitis is then also common. Trismus is present in these cases because the pterygoid muscles are in the area of suppuration. The temporomandibular articulation is also not distant, and I believe both of these are factors in the persistence of trismus after complete healing. Exercises and spring-stretching of the bite are indicated as after-treatment.

Pharyngomaxillary Infection. — Pharyngomaxillary infection from the mandible which strikes directly backward into the pharyngomaxillary, or parapharyngeal, space arises from the region of the molar teeth of the mandible, particularly the third, or from the region of the inner side of the ramus after injection of the mandibular nerve. I have seen it follow apical abscess infection of the third molar after a large crown cavity had been filled. It caused complete trismus, and the abscess ruptured through the upper part of the empty tonsillar fossa into the pharynx. This spontaneous drainage resulted in prompt and complete recovery. A week later, the tooth was extracted under general anesthesia, with no complications.

Cervical Adenitis Following Dental Infection.—This type of infection extends directly from the point of dental infection into the cervical lymph nodes, most frequently into the upper deep median nodes on the vascular sheath just below the angle of the jaw. Sometimes, the glands in the submaxillary and submental triangles are first invaded, after which those mentioned above may be secondarily involved. The intervening soft parts are not inflamed, and there is no cellulitis as in Ludwig's angina. Gland abscesses are not uncommon in this type, occurring more frequently in children. The sepsis is usually not severe if drainage is applied when indicated. There may be spontaneous subsidence without abscess formation. Fluctuation and digital pitting are common indicators of underlying pus in this type of infection.

Prevention.—It is probable that the dentist and oral surgeon are deeply interested in any pronouncement that will serve as a guide in the avoidance of activating or precipitating infection from the dental region; also in the detection of dental infection which can be recognized as a potential source of infection beyond the strictly dental region. Unfortunately, no such definite pronouncements are possible. Such convictions as I have acquired out of my experience are most humbly and respectfully submitted.

It would seem that it is advisable to make a thorough examination of the mouth before proceeding with any dental surgical measures. This should include careful roentgen and bacteriologic studies. If there are acute alveolar abscesses, the object is drainage, best accomplished by simple removal of the tooth. This should be done with the least possible instrumentation of the bone involved in the abscess cavity. Extensive curettage is to be avoided at such a stage. Even packing should be gentle. That tight packing interferes with drainage suggests itself to me from my experience with infected bone in other regions. Fill-

ing a tooth the roots of which are situated in an abscess is obviously courting trouble. A strictly aseptic surgical technic should be carefully observed throughout. It is inadvisable to inject a local anesthetic into or near an inflamed gum, or even into one that is liable to become inflamed secondarily to the dental or alveolar infection. A distant nerve block is probably less risky. General anesthesia or postponement of any radical dental operation would seem the best policy. It is conceivable that infection may follow an extraction performed when no apparent infection is present. The dentist or oral surgeon should give the general health of the patient some consideration. Tuberculosis, syphilis, blood dyscrasia, avitaminosis and metabolic disease are but a few of such possibilities. As in other special surgical fields, the more one works with the general medical adviser, the better is one informed as to the patient's condition locally and generally.

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MODERN TECHNICS IN SURGICAL PERIODONTIA

By OLIN KIRKLAND, D.D.S., Montgomery, Ala.

THERE are two paramount and fundamental problems in dentistry, one involving the integrity of the tooth structure itself, the other, the health of the supporting tissues of the teeth. The major problem is dental caries, which attacks the tooth structure early in life. The other important problem is periodontal disease, which attacks the supporting tissues and, in adult life, is almost as common as caries, sharing with it equal responsibility for the world's dental cripples.

Like caries, periodontal disease is not fully understood etiologically. It is commonly known, however, that it can be cured through treatment directed at local symptoms, and therefore it must be assumed that the most important etiologic factors are of local origin.

It is usual, in the treatment of periodontoclasia, to observe an improvement in general health following eradication of focal infection. Frequently, also, obscure muscular and joint pains have been permanently relieved by the treatment of gingival pus pockets, and, in many instances, organic disease of a more or less serious character has been known to be ameliorated or cured.

It is commonly believed that most diseases are caused by bacterial invasion of the circulatory system. If this is true, there is every reason to assume that an oral infection, when associated with general disease, provides an additional load of bacterial toxins, which must be neutralized by the already overburdened defensive forces within the blood. Consequently, an individual suffering from any disease, but enjoying the benefit of a clean, healthy mouth, undoubtedly has a better chance for recovery than one with a badly infected mouth.

After more than twenty-five years' experience in the practice of periodontia, I am convinced that the presence of pus pockets around the teeth has a much greater influence upon the general health than is commonly supposed. In view of the fact that but little attention has heretofore been given to periodontia in dental practice, and because of its importance as a health problem, there is little

doubt whether the dentist of the future will be in a position to make a much more valuable contribution to public health than has been made by the dentist of the past.

The pioneers in modern periodontology have broken down many barriers to successful management of this disease, and there is no longer any reason that it should not be handled with the same degree of success as are other dental problems which daily confront the profession.

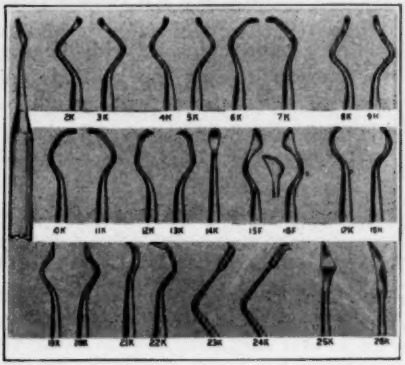

Fig. 1.—Complete set of curets and knives used in surgical eradication of periodontal lesions.

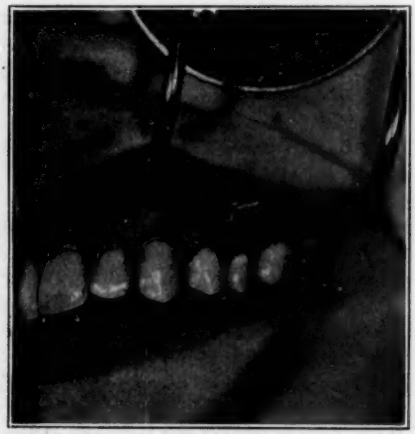

Fig. 2 (Case 1).—Buccal and labial incisions made in crescent segments, following original outline of gingivae, to preserve natural appearance of gums immediately after operation. There should be little, if any, change in the appearance of the gum line and gingival curvature when the surgical dressing is removed.

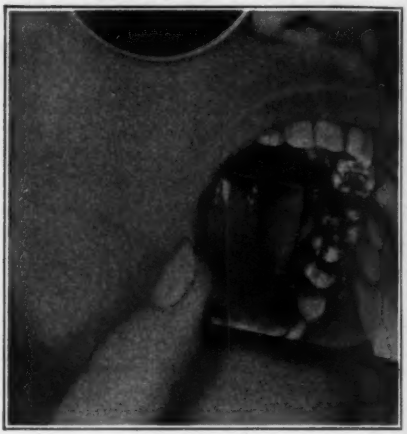

Fig. 3.—Straight line incision, on lingual exposure, made at point to expose full depth of pockets.

Fig. 4.—Semiflap, with retraction of tissue to provide open view as well as freedom of movement of instruments in area involved in operation.

In view of the fact that the ravages of this disease cause the loss of at least 50 per cent of the teeth extracted today,

it may be said without fear of contradiction that periodontal disease is today dentistry's most urgent problem.

In making the statement that periodontal disease can be cured, I do not intend to convey the impression that all types and all stages of the disease, regardless of unfavorable physical conditions, can be managed successfully; nor would I claim that the disease cannot recur after treatment. I do wish to make it clear, however, that when the prognosis is favorable and correct principles

Fig. 5.—Removal of gingiva to full depth of pocket, providing full view of field of operation and ample drainage to wound.

Fig. 6.—Case shown in Figure 5; immediately after operation. The same technic was used as in the maxillae.

Fig. 7.—Surgical dressing applied smoothly over wounded surfaces and necks of teeth throughout areas of operation, interdental spaces having been carefully packed first. This procedure protects the wounds against pain, hemorrhage and irritation from outside influences until healing and regeneration of new tissues have taken place.

Fig. 8.—Appearance of upper and lower teeth and gums twelve months after operation.

of treatment are applied, the results are invariably satisfactory.

Within the past twenty-five years, great changes in treatment of periodontal disease have taken place. Methods of procedure which we once viewed with approval, we now realize had no practical value. One who is prepared to treat this disease must first understand its etiology, then select a successful method of procedure, provide the instruments and equipment best suited to execute the technic of choice and learn how to use them to the best advantage. Certain facts should be established before beginning treatment, since the plan of procedure must be based upon the local and general physical conditions present in each individual case.

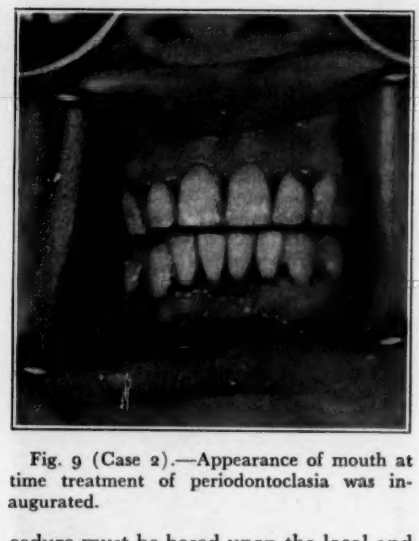

Fig. 9 (Case 2).—Appearance of mouth at time treatment of periodontoclasia was inaugurated.

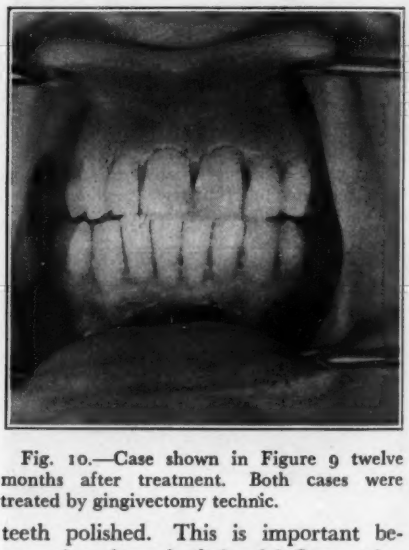

Fig. 10.—Case shown in Figure 9 twelve months after treatment. Both cases were treated by gingivectomy technic.

EXAMINATION AND DIAGNOSIS

The first step is a thorough examination, leading to correct diagnosis. The examination should include an x-ray examination of the teeth and their supporting structures; a study of the tone and color of the gingival tissues, and a thorough probing of the gingival crevice around each tooth in order to check the findings with the evidence of missing bone tissue shown in the roentgenograms. The depth and location of pockets should be indicated on a chart to be used as a guide in treatment and filed with the x-ray pictures for future reference. And, of course, the examination would be incomplete without a complete history of the case.

PREPARATION FOR TREATMENT

Before surgical treatment is started, the mouth should be made as clean as possible. All visible stains and deposits should be removed from the teeth and the gums should be stimulated and the teeth polished. This is important because it reduces both local inflammation and the degree of infection throughout the mouth, and provides a cleaner operative field. The cleaning and stimulation, which may require two or three visits, can be handled by a competent hygienist.

SURGERY

The infective factors responsible for the local manifestations of the disease are located within the pockets, consisting of serumal deposits, granulated

epithelial tissue and infected bone surfaces that have been deprived of their protective periosteum. Without complete eradication of these foci of infection, there is little hope of successful treatment of the disease.

Surgical treatment is the only dependable approach in the treatment of periodontal disease. Nerve blocking, supplemented by infiltration anesthesia, is the preferred method of preparation for surgical measures, and, in many cases, premedication is advisable.

GINGIVECTOMY AND SEMIFLAP TECHNIC

The first step is to ascertain the location and depth of pockets by probing. The probe will serve to determine the depth of the incisions to be made. The gingival tissue should then be excised to a point at or near the bottom of the pocket.

After removing the overlying tissue, the next step is the equally important, but more difficult one of eliminating the infective foci that were inside the pockets. For this purpose, I use instruments in the following order:

1. Ward's interproximal curets, to break up the pathologic, granulated epithelial tissue in the interproximal areas. As much of this tissue as possible is removed with these instruments.

2. Buck's interproximal files, to break down and smooth the sharp edges of bone that frequently form the lingual, buccal and labial borders of pockets. These files also aid in removing some of the granulated tissue.

3. Small, curved shears and manicure nippers, to cut away pieces of tissue usually found protruding from the pockets.

4. Almost any set of periodontal curets, to complete the remainder of the operation. To conserve time and increase operating speed, and to economize in the loss by breakage through the employment of delicate instruments, I prefer to use instruments of my own design, ranging in numbers from 1 to 18, beginning with No. 1, and following with the others in sequence throughout the operation. With few exceptions, these instruments are made in right and left angles. They are more or less spoon-shaped to follow the concavities of the pockets, and are strong and heavy enough to withstand the force necessary to remove the hard calcific deposits from the roots of the teeth.

In addition to removing deposits from the root surfaces, these instruments are used to curet the infected pericementum and smooth the floor surfaces of the pockets. They also aid materially in removing small fragments of granulating tissue.

In order to observe the field of operation better during the course of treatment, it is advisable to use a head lamp, diagnostic lamp and mouth mirror.

It is impossible to treat periodontal disease successfully by the surgical method unless the field of operation is kept clean and free from blood and saliva. This can be accomplished with an aspirator and sponges in the hands of an efficient assistant. Allowing an antiseptic solution to drip over the teeth and bleeding surfaces, and drawing it out as rapidly as possible with an aspirator, will obviate the use of sponges to a certain extent and prevent accumulation of blood on the root surfaces, which has a tendency to cause curetting instruments to slip over the deposits without removing them.

To remove loose particles of infected débris, such as fragments of bone, granulation tissue, root deposits and blood clots, it is advisable from time to time to use an antiseptic solution with a pressure spray. This should be used at intervals throughout the course of operation.

To keep instruments clean and ready for repeated use, it is advisable to have an instrument bath convenient and drop them in it as they are used. Germicidal disks of potassium mercuric iodide have

been found both satisfactory and non-irritating.

When the operation is completed, and before a surgical dressing is applied, free circulation in the involved tissues is increased by the application of packs made of cotton dipped in a hot saline solution. The excess solution is squeezed out in a sterile towel and the packs are placed firmly over the area. This procedure is repeated two or three times.

A surgical dessing (Fig. 7) should be properly mixed and applied smoothly over the necks of the teeth and wounded gum surfaces. The dressing should be left on for about two weeks, but if it becomes loose or comes off, it should be replaced as soon as possible. In some of the deep-seated lesions, it is advisable to repack and let the dressing remain in place for another two weeks.

It is possible to treat the entire mouth in one or two days, but it is much better to operate on one quadrant of the mouth at a time, and follow with the succeeding operations at intervals of one or two weeks.

The upper and lower teeth on one side of the mouth should be treated and given time to heal before treatment is started on the opposite side.

POSTOPERATIVE CARE

Gentle toothbrushing and interdental stimulation immediately after removal of the surgical dressing is recommended and the teeth should be cleaned and polished at frequent intervals during the course of treatment. This will materially aid in the formation of firm, healthy tissue between and around the teeth. (Fig. 8.)

OCCLUSION

Three or four weeks after the last operation, the teeth should be ground to occlusion if necessary.

DIET

It is advisable to inquire into the dietary habits of the patient, suggesting such changes as may be necessary to provide the correct food elements to build body tissues and maintain health.

POSTOPERATIVE TREATMENT

Regardless of the perfection of the technic, whether a radical method or a conservative approach, the treatment will surely result in failure unless the patient cooperates in the care of the mouth. Throughout the course of treatment, advantage should be taken of every opportunity to discuss the importance of the home care of the mouth. No doubt should be left in the patient's mind concerning the part he must play in maintaining his mouth in a state of health. The operator should teach the patient the correct technic of toothbrushing and gum stimulation, and until he shows that he is capable of following the proper technic, he cannot be considered ready for dismissal.

At least twice a year, and oftener if necessary, the patient should return for prophylaxis and examination. If examination reveals a recurrent lesion in some neglected area of the mouth, it should be given prompt attention, and the patient should be instructed to give this particular region of the mouth more careful attention in the future.

The development of a greater knowledge and a better understanding of periodontology in the daily practice of dentistry will undoubtedy provide the important steppingstone for the next forward movement in dental progress.

Shepherd Building.

IS VINCENT'S INFECTION A COMMUNICABLE DISEASE?

By THEODOR ROSEBURY, D.D.S., New York, N. Y.

VINCENT'S, or fusospirochetal, infection of the mouth or throat—the "trench mouth" of the last war—is commonly looked upon as a communicable or contagious disease. According to Cady (1939), Vincent's infection is reportable by statutory provision in twenty-two states, and is the only reportable oral disease. It is frequently observed in several members of one family, or in other groups known or assumed to provide opportunities for transmission by direct or indirect contact. More or less severe outbreaks of the disease have been reported on several occasions, often under conditions regarded as indicative of epidemic spread. On the other hand, there is abundant evidence that the development of Vincent's infection depends on impairment of resistance, a result of nutritional or other deficiency.

It is now known, moreover, that the micro-organisms responsible for the characteristic symptoms of this disease occur widely if not universally in mouths. It is therefore unnecessary to postulate their introduction from the outside world as a prerequisite for the appearance of symptoms. On the contrary, Vincent's infection seems to be one of a group of endogenous infections which, like subacute bacterial endocarditis or peritonitis due to intestinal perforation, are induced by ordinarily harmless surface parasites under particular conditions. These diseases as a group are not communicable.

Is Vincent's infection a communicable disease? Is an appreciable degree of communicability reconcilable with the requirement for predisposition and with endogenous infection? This paper attempts an analysis of these questions.

Although this subject is of practical importance at all times and in ordinary practice, its importance is greatly increased in war time. Outbreaks of Vincent's infection among troops were a serious problem in the last war, and may become so again. If they are epidemics, as Gunther (1941) stated in a recent U. S. Army publication, isolation and strict sanitary precautions should be imposed during their prevalence. Such measures are apparently being enforced in the British army, according to the most recent information (anonymous, 1942). But isolation is a difficult and costly procedure, particularly if it must be applied to a large number of patients. If it is not needed, to use it is wasteful and inefficient. Wastefulness and inefficiency were never less desirable than they are in modern war. It is therefore fitting and timely that the basis for isolation or other precautions against the possible spread of Vincent's infection be examined critically.

EVIDENCE OF MAN-TO-MAN TRANSMISSION OF VINCENT'S INFECTION

Many reports have described or referred to outbreaks of Vincent's infec-

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tion or recorded observations suggesting its transmission from person to person. Most of the earlier reports dealt with the prevalence of the disease among troops in the first World War. It is interesting to note that, on the Western Front, Vincent's infection seemed to affect the Allied troops, but not the German, according to Schoetz (1920) and Kronenberg (1920), both of whom recorded the observation that the disease was uncommon among German soldiers, and did not assume prominence in Germany itself until the latter part of 1919. According to Bouty (1917) and Courcoux and Debré (1920), the French troops were affected during the war years; but the most significant outbreaks seem to have occurred among English, Canadian and American troops. Mitchie (1928) has presented tabular data indicating that in the U. S. Army alone during the years 1917 through 1919, there were 6,189 recorded admissions and 92,690 days lost from Vincent's infection of throat or mouth. Bowman (1916), Goadby (1916), Taylor and McKinstry (1917), McKinstry (1917), Campbell and Dyas (1917), Semple, Price-Jones and Digby (1919), Laughlen, Warner and Holmes (1919) and Reckord and Baker (1920) all reported on World War outbreaks of trench mouth or Vincent's angina among Allied troops. It is unnecessary to review all these reports in detail here; but it may be said at once that a careful reading of all of them reveals no adequate evidence of man-to-man transmission of Vincent's infection. Representative examples are worth citing in some detail.

In several of the reports, the idea of communicability is either taken for granted and not analyzed, or is based loosely on the mere concurrence of cases among those assumed to have had opportunities for contact. Thus, Bowman (1916) stated, without giving evidence or direct reference, that "the use in common of drinking cups, tobacco pouches, dishes, etc., has been shown to have caused epidemics." In his own series of cases, he reported that,

> In one instance, several cases were traced to a dentist who had treated a severe gingivitis or pyorrhea, and the same day treated three other men for the same reason, and these later contracted the disease and were shown by stained smears to be infected with Vincent's organisms.

Bowman, it may be noted, had been led by the observation of positive smears in pyorrhea to infer that pyorrhea is a form of Vincent's infection. The occurrence of the fusospirochetal flora in pyorrhea is now well established, as will be noted later; but this disease is not ordinarily regarded as communicable in itself, nor is it generally believed that a case of pyorrhea can give rise to cases of true Vincent's infection.

McKinstry (1917) made the interesting comment that Vincent's angina and gingivitis

> . . . do not appear to be highly infectious. Many cases of severely affected gums and Vincent's angina were treated in the medical wards [of Queen Alexandria General Hospital in London] without any of the nursing staff or any of the other patients becoming affected.

McKinstry nevertheless goes on to say that "several of my cases prove the disease can be conveyed from one person to another." He cites a group of case reports, two of concurrence in husband and wife, and one in a soldier who "thought he caught his complaint a month ago through using by mistake a tooth-brush of one of the men under treatment" [for Vincent's infection] and adds "I . . . examined the tooth-brushes of the four affected men, and found fusiform bacilli in all."

McKinstry's further remarks seem worth quoting in full:

> There can be no doubt that the disease can also be conveyed by the mouthpieces of pipes, cigarette-holders, gas-masks, and other articles coming in contact with the mouth, and I have found fusiform bacilli in smears taken from the inside of mouthpieces of pipes

and cigarette holders. These modes of infection, however, account for only a few of the cases seen. Many of the cases were living at their homes, or in billets removed from overcrowding and insanitary conditions, and from whom no evidence of infection could be obtained. The origin of the affections in these cases seems to find the best explanation in the frequency with which the exciting organisms are found leading a saprophytic life in what appear to be healthy mouths.

The data given do not demonstrate that the instances cited of concurrence of infection in married couples, or even the toothbrush incident, were actually cause-and-effect relationships rather than coincidences.

It may be worth while to cite another example of the sort of circumstantial evidence which seems to form the only basis for the idea of communicability of Vincent's infection. Laughlen, Warner and Holmes (1919) reported that trench mouth was common among civilians as well as among soldiers in Canada. They offered the following statement on communicability:

> That the disease occurs in epidemics there can be no doubt. In the officers' mess of the 97th battalion, in the Spring of 1916, one case occurred among thirty officers. This was followed by six other cases during the following six weeks. In another instance in a small boarding house, two boarders became infected from a third one who suffered from the disease. One of our cases occurred in a doctor who a short time previous to graduation was employed in a drug store. He states that the proprietor had a chronic ulcerative patch in his tonsil. He attributes his infection to using a lead pencil in common with the proprietor.

Again coincidence is not ruled out, and the possibility of common predisposition, which might well have operated among soldiers through dietary deficiency or otherwise, is not taken into account.

None of the investigators of outbreaks of Vincent's infection in World War I seems to have undertaken a detailed epidemiologic study, with an attempt to check the history of contacts critically or otherwise to verify the epidemiologic chain of events. On the other hand, not all seem to have taken communicability for granted. Reckord and Baker (1920), for example, point out, without special comment, that among fifty-six soldiers affected in an outbreak at Camp Devens, Mass., in 1918-1919, only eight gave evidence of having been in contact with others who had similar symptoms. Clewer (1923) repeated the statement that the disease is contagious, although he reported finding Vincent's organisms in all mouths, even the healthiest. On the other hand, he attributed the abnormal incidence of Vincent's infection during the war years to "a deficiency disease arising from the lack of anti-scorbutic vitamine in the diet of the troops on active service."

What may be regarded as a striking item of negative evidence is provided in the carefully detailed report of Semple, Price-Jones and Digby (1919), which deals with the examination of 3,000 British soldiers, and presents both clinical and laboratory studies conducted for the British War Office in an effort to define the etiology of the disease and to develop means for its control. In this 35-page report, there is no allusion to the idea of communicability, either in the text at large or in the authors' recommendations for control, the most relevant one of which reads as follows:

> In the meantime can anything be done to minimize the conditions of teeth and gums existing among soldiers of all ages? The answer rests with *cleanliness of the mouth and skilled attention to the teeth.*

Among reports of outbreaks of Vincent's infection since the close of the last war, that of Pardee, Gordon and Riley (1928) contains interesting details. These authors described an outbreak among students at Smith College, which began with the observation of one student with typical severe Vincent's infection and gingivitis. Her roommate developed mild symptoms a week later, and went to the

infirmary. Meanwhile, another student roomed with the first patient, and her smear, which had been negative, later became positive, although she was not described as having developed clinical signs of infection. Another student definitely exposed to the first case yielded fusiform bacilli, but no spirochetes, and likewise presumably no clinical symptoms. Examination of smears from the gums and throats of 462 students during the ensuing few weeks revealed 139 with positive smears, 113 of whom showed "mild but definite clinical involvement," while only a single case in addition to the original one showed typical acute Vincent's infection. The condition was not confined to a single dormitory, but was widespread over the campus. The study was terminated by the Spring vacation. On the return of the students, only "four or five" were found to show any symptoms. The authors do not suggest that this experience constituted an epidemic. It may be doubted whether the reported prevalence was greater than might have been found at any time in a random sample of the population. That it was discovered and reported may perhaps be attributed to increased interest in the disease, on the part of the students as well as of the examiners, awakened by the first case. In the absence of well-defined clinical involvement, rather than positive smears, which in themselves have little significance, these findings do not point convincingly to contact transmission.

More recently, Smith and Dusinberre (1935) described two cases of severe Vincent's infection occurring in a girl and her brother. The boy developed the disease four days after the girl. "The second patient remembered drinking out of his sister's glass the day before she was admitted to the hospital." The girl had evidently had an antecedent gingivitis, but it is said of the boy that his gums were in a healthy condition before the onset of illness. No details of this circumstance are provided in the report. Both cases were severe, with general symptoms and a tendency to leukopenia with a decrease in the absolute polymorphonuclear cell count. As has been pointed out elsewhere (Rosebury, 1938), there is evidence that leukopenia is to be regarded as predisposing to rather than resulting from Vincent's infection; and this episode is also open to the interpretation of coincident predisposition in two members of a family, as well as to that of contagion.

A severe and extensive outbreak of Vincent's infection was described by Goodrow in 1936. Of 9,404 cases examined in five counties of the San Luis Valley of Colorado, 3,782 were reported to have been positive both clinically and by smear. The cases examined were chiefly in school children, but also included family contacts; and whole families were found to be affected. Cases were described as both acute and chronic, and they appear to have been very severe, with marked hyperemia of the mucous membrane and a tendency to loosening of the teeth in addition to the more customary picture of ulceration, pseudomembrane formation and fetor. Communicability was assumed, and, in the chronic cases, the patients were considered to be carriers, important in the spread of the infection. Goodrow noted, on the other hand, that dietary deficiency was very prevalent in the area, "resulting perhaps from lack of dairy products, fresh vegetables and fruits." The outbreak, moreover, seems to have occurred "as an aftermath of influenza, scarlet fever and other illness confining the patient to bed." Although the probable significance of these predisposing conditions was recognized, no data were offered which might make it possible to determine the relative importance of predisposition and contagion, or to exclude the possibility that the whole episode was actually an outbreak indicative of nutritional deficiency, perhaps scurvy with superimposed B-complex deficiencies, and with the endog-

enous secondary fusospirochetal infection which one would expect under such conditions.

Thus far, in the present war, severe outbreaks of Vincent's infection do not seem to have been reported. Fenske (1941) has described what is called a mild epidemic at Fort Custer, Mich., between October 1940 and January 1941, with 183 cases (14.3 per cent) among 1,223 men up to December 15, and 217 cases (7 per cent) among 3,561 men during the last month. Again communicability was assumed, but the situation was not subjected to analysis. An attempt at quarantine was made, with patients confined to their posts; and "as far as possible, the utensils that each man used were kept separate from the others and were sterilized by being scalded with hot water." This procedure is suggestive of half-measure isolation, implying that the disease is considered somewhat contagious, but not sufficiently so to warrant rigorous isolation. The report indicated that most of the patients recovered promptly under routine treatment and that there were no recurrences. It is not possible to determine what part, if any, the sanitary precautions employed may have played in this favorable result.

In another recent report, Burch (1941) stated that six cases of acute ulceromembranous stomatitis were found among 1,261 flying cadets at Kelly Field, Texas. These patients were hospitalized, and it appears that they may have been isolated, since the cases were regarded as presenting "acute contagious oral conditions." The report does not make the circumstances entirely clear. Hospitalization and possibly isolation were resorted to here perhaps because the number of cases was small, whereas the Fort Custer outbreak may have been too extensive to justify the measure. The suggestion seems inescapable that although the highly contagious nature of Vincent's infection is often spoken of, the condition is not always taken seriously.

Webster (1941) recently reported a marked increase in the prevalence of Vincent's gingivitis at the Glasgow Dental Hospital during the past two years. He suggested, as did McKinstry in 1917, that the disease is seasonal to some degree, occurring chiefly in the winter months. But whereas, before 1939, only about half a dozen cases in all were seen during each year, thirty-two cases were treated from September 1939 to September 1940, and in the following year the number rose to 228, with cases appearing almost daily. Webster remarked that this increase during two years of war "favors the view that apart from the organisms present, it is a deficiency disease, probably due to the scarcity of fresh fruits and vegetables, etc., with the consequent lack of vitamins." He nevertheless makes the common unsupported assumption of communicability:

> There is evidence [none is given] that this disease is communicable directly and patients should be warned to refrain from kissing and should have cups, towels, etc., kept for their own use.

The reader is cautioned against surgical work on patients with the disease, and told to remove débris from the teeth with "wisps of cotton . . . or a fine stream of water, but never use a spray for one's own sake." It would be interesting to know whether there has ever been an authenticated instance in which a dentist contracted Vincent's infection from a patient with the disease.

In another recent British report, on the other hand, McClarence (1941) approaches, as nearly as any one seems to have done, a frankly skeptical attitude toward the question of communicability of Vincent's infection. In a report on treatment of the disease in the Royal Navy, he indicates that he is "not entirely convinced of the highly contagious nature of the condition." He notes that,

> Considering the prominence given in the textbooks to the extremely infectious nature

of the condition, it appears strange that, in forty cases out of a total of nearly 4,000 men in two months, seldom more than two, and never more than three cases were found in one mess or establishment at any one time.

McClarence does not dismiss the idea of contagion, and recommends sterilization of cutlery and crockery during outbreaks; but he considers predisposing factors more important in determining outbreaks of Vincent's infection.

The micro-organisms of Vincent's stomatitis and Vincent's infection are also found, and are implicated as causative agents, in diseases of body areas other than the throat and mouth. Are any of these known to be communicable? The most noteworthy of these extra-oral processes from the viewpoint of this paper is genital fusospirochetosis, or the so-called fourth venereal disease of Corbus and Harris (1909). Certainly, if fusospirochetal infection can be transmitted by contact, lesions on the genitalia should be ideally situated for the purpose. Yet it is by no means clear that such transmission actually occurs. Again the problem is complicated by the circumstance that the organisms occur in the absence of disease of the external genitalia of both males and females (Brams and Pilot, 1923; Pilot and Kanter, 1923), and that they are commonly found as contaminants or secondary invaders in lesions caused by other organisms, notably those of syphilis. As is true of the mouth, the widespread distribution of these organisms among the general population makes it necessary to postulate that they can be transmitted or become pathogenic only under conditions of lowered natural resistance. Hence, the same circumstances prevail as with mouth infections, and the same obstacles make it peculiarly difficult to determine communicability. Corbus and Harris state that a long tight foreskin, or the practice of wetting the labia or penis with saliva, predisposed to the infection. Reasoner (1927) observed that the disease did not occur in the circumcised. It may be noted that the preputial sac is the area in which the fusospirochetal flora occurs normally in males. Presumably, the organisms are likewise not found normally in the circumcised. Among recent writers on genital fusospirochetosis, both Greenblatt and Wright (1936) and von Haam (1938, 1940) seem to be of the opinion, although not unequivocally, that the disease (in women) is not venereal; that is, not communicable by sexual contact. As von Haam (1940) puts it,

> . . . a generalized weakened constitution such as seen in patients recovering from a severe sickness or in persons of poor economic circumstances is probably a much more important factor for the establishment of the infection than the exposure of the vulva to the organism.

While again the evidence is not conclusive one way or the other, it does not seem probable that genital fusospirochetosis is as "highly contagious" as the mouth and throat infections are commonly believed to be, despite the fact that the genital lesions provide much better opportunity for contact transmission.

There is at least one group of fusospirochetal or related infectious processes which are clearly transmitted from man to man, but only for a single passage. These are the human bite or tooth-injury infections, such as those reported by Peters (1911), Apostolides (1922), Fuller and Cottrell (1929), McMaster (1939) and Barnes and Bibby (1939). These infections, caused by introduction of fusospirochetal and possibly other mixed micro-organisms of the mouth under the skin in an area traumatized by the teeth, correspond with the experimental lesions produced in animals by inoculation with a syringe, which will be considered later. Like the experimental lesions, the tooth-injury infections in man are not known to be communicable spontaneously beyond the first case; but, as will be noted, they provide confirmatory

evidence of the pathogenicity of the mouth flora.

King (1940) and Schwartzman and Grossman (1941) have reported attempts to submit the question of communicability of Vincent's infection to actual experiment on human subjects. The latter workers studied the "acute gingivostomatitis" of children, which appears to be primary herpetic infection rather than true Vincent's infection (Dodd, Johnston and Buddingh, 1938, 1939; Burnet and Lush, 1939; Burnet and Williams, 1939; Scott, Steigman and Convey, 1941). Their subjects nevertheless all had smears positive for the fusospirochetal flora, and their results therefore have at least suggestive validity. Attempts were made to transfer the infection from the mouth in seven cases positive both clinically and by smear to eleven cases with intact mucous membranes of mouth and throat. These attempts were unsuccessful. Fourteen other unaffected children were then treated similarly except that before transfer of exudates, the gums, pharynx and tonsils of the recipients were traumatized mechanically by rubbing with sterile cotton on applicators. Again the attempts were unsuccessful, no infection resulting.

King used exudate from the infected socket of a patient with diffuse ulceromembranous gingivitis following extraction of a tooth, transferring it immediately to his own mouth and to the mouth of a monkey. In both subjects, the area selected, an interdental papilla, was first traumatized, and the infected material was then packed down between gum and teeth. King had purposely neglected the hygiene of his mouth for several weeks, and limited his intake of vitamin C by restricting fruit. The monkey was apparently on a good diet. Previous smears were said to have shown no spirochetes or fusiform bacilli in either mouth. After the inoculation, these organisms remained plentiful for forty-eight hours in the author's mouth and then disappeared without treatment, no gingivitis having developed. A diffuse gingivitis appeared in the monkey, but subsided without treatment after nine days.

It is of interest to note here parenthetically that, as early as 1859, in the prebacteriologic era, Bergeron recorded unsuccessful attempts to transmit the "ulcerative stomatitis of soldiers," as he called it, to his own mouth and to that of another human volunteer. Bergeron had no doubt that the disease was contagious. His inability to transmit it, and certain peculiar incidents in the experiment conducted on himself, which were undoubtedly coincidental, led him to believe that "miasmatic" infection was more important than contact in transmission of the disease.

OTHER EVIDENCE BEARING ON THE COMMUNICABILITY OF VINCENT'S INFECTION

Since the evidence of man-to-man transmission of Vincent's infection is circumstantial at best, and on the whole unconvincing, it is necessary to look elsewhere in an effort to determine whether the disease is communicable. The evidence bearing on the etiology and pathogenesis of Vincent's infection may help to clarify the subject, although it cannot be expected to provide a final answer to the question in the title of this paper.

It is clear that a peculiar group of micro-organisms found in the lesions of Vincent's infection is capable of inducing in animals transmissible disease with symptoms characteristic of lesions in man: ulceration or necrosis of tissues, fibrinous exudation or pseudomembrane formation and typical fetor. This subject was reviewed for this society three years ago (Rosebury, 1939). Such experimental lesions have been produced in animals by the use, first, of exudates from fusospirochetal disease in man (Veszpremi, 1905, 1907, 1908; Paul, 1901; Kritchewski and Seguin, 1920; and others), and, secondly, by inoculation with mixtures of pure cultures of species isolated from such exudates (D.

T. Smith, 1930, 1932; Proske and Sayers, 1934). These pure culture studies confirm evidence provided in the experimental studies with unpurified exudates that a combination of four kinds of micro-organisms, a small spirochete, a small nonmotile fusiform bacillus, an actively motile vibrio and a streptococcus, all anaerobes, develops the required pathogenic properties.

There is little doubt, moreover, that all these organisms occur very widely in the mouth, in the absence of symptoms of clinical Vincent's infection. Typical smear pictures of Vincent's gingivitis are not found in scrapings from healthy gingival tissues, as Appleton (1933) has pointed out; but they are found in smears from very mild inflammatory processes, such as traumatically induced gingivitis limited to a single gingival papilla, as well as in more severe conditions. They are found regularly and in profusion in the pockets of pyorrhea (Kolle, 1917; Kritchewski and Seguin, 1918), in "dry socket" (Schroff and Bartels, 1928) and in periapical infections (Davis and Moorehead, 1923). We have found them in these conditions, and also in simple or marginal gingivitis and in the exudate under inflamed third molar flaps. Since few adults' mouths are entirely free from inflammatory processes of the gingival tissues, the widespread distribution of the fusospirochetal flora is not incompatible with their absence from or scarcity on strictly healthy tissues. The percentage showing the organisms would probably be very high if material for examination were taken by curet from selected subgingival areas rather than from more exposed surfaces of the mouth.

For about five years, we have been inoculating guinea-pigs routinely with exudates from several diseases of the mouth, as well as from extra-oral fusospirochetal processes, in order to maintain a source of material for studies on the cultivation of spirochetes and other members of the oral flora. In our experience, exudates from pyorrhea, simple gingivitis and inflamed third molar flaps, the three conditions, other than Vincent's infection proper, most frequently represented in our trials, are as effective in producing transmissible fusospirochetal disease in guinea-pigs as are exudates from clinical Vincent's infection itself. The four conditions do not differ significantly, either in the frequency with which experimental inoculation is successful, or in the character of the animal lesion that results, which is the typical serially transmissible fusospirochetal abscess or phlegmon. These findings, which will be described elsewhere in more detail, are not offered as suggesting that these four conditions are similar in any other respect than that the microbial flora of their respective exudates is alike in pathogenic capacity: all four diseases harbor similar potentially pathogenic fusospirochetal organisms.

The foregoing findings bear directly on the question of the communicability of Vincent's infection. Since the distinctive microbial flora of Vincent's infection is capable of inducing disease in animals which can be transmitted from animal to animal in indefinite series, the possibility that Vincent's infection in man is likewise transmissible can certainly not be excluded.

It seems worth noting, in this connection, that experience with human tooth-injury infections, mentioned previously, suggests that human beings react much as do guinea-pigs to the subcutaneous inoculation with fusospirochetal flora. Nevertheless, this pathogenic flora is not confined to clinical Vincent's infection, but is also found in other mouth diseases not considered communicable, and the findings suggest that the flora of Vincent's infection proper is not more virulent or in any other way distinctive in potential pathogenicity. It has been noted previously that human tooth-injury infections are not known to be

transmitted beyond the first passage. Experimental fusospirochetal infection in the guinea-pig is transmitted by subcutaneous or other parenteral inoculation of exudates. It cannot be transferred merely by contact with mucous membranes, even when a very large amount of exudate highly active by the usual routes is used. We have taken no special precautions to avoid spontaneous transmission of the disease among our experimental animals; but normal animals have never acquired infection in our experience as a result of contact with infected animals. In other words, the transmissibility of experimental Vincent's infection, in so far as its bearing on the spontaneous transmissibility of the human disease is concerned, may be looked upon, like anaphylaxis as Burnet described it, as an artefact due to the use of the hypodermic syringe.

To these considerations must be added the evidence of predisposition as an important factor in the development of Vincent's infection. This evidence has also been reviewed elsewhere (Rosebury, 1938). The subject is a complex one, and it is not as yet possible to define any single type or mechanism of predisposition which is uniformly concerned. There is abundant reason to believe, however, that tissue damage, not itself induced by the fusospirochetal flora, allows or encourages this ordinarily harmless group of micro-organisms to proliferate and to invade the tissues more or less deeply. Such damage may be brought about by long-continued surface irritation; by deficiency of vitamin C or nicotinic acid or other foods; by intoxication with mercury or other agents, and perhaps in other ways as well. When the underlying cause of such predisposition can be found and removed, the fusospirochetal infection can evidently be controlled without resort to direct antimicrobial measures, as in the treatment of simple gingivitis by removal of salivary calculus, or in the treatment of pellagra, with superimposed fusospirochetal infection, by administration of nicotinic acid. The common experience that Vincent's infection does not respond uniformly to any one therapeutic agent or method may be interpreted as pointing to the disparity of predisposing conditions, not all of which have yet been determined.

These facts are all compatible with the general hypothesis that fusospirochetal infections are endogenous: are due, that is, to tissue damage resulting from another condition, with subsequent invasion by micro-organisms normally confined harmlessly to the surface of mucous membranes. Vincent's infection proper may be included in this category, as well as simple gingivitis, pyorrhea and such extra-oral diseases as lung abscess, tooth-wound infections, gangrenous balanitis and the many other fusospirochetal infections described by D. T. Smith (1932). The distinctive clinical features of each disease, for example the clinical differences between Vincent's infection and pyorrhea, may be due to characteristic differences in the mechanism or nature of the predisposition, and thus occur despite a common superimposed infection.

Tissue damage, perhaps of more than one basic type, and certainly having more than one manner of origin, may thus be postulated as essential for the development of fusospirochetal disease. Disease of mucous membranes upon which the fusospirochetal flora occurs normally, such as the mouth, throat or genitalia, may be induced by this one condition, tissue damage, alone. Disease of areas in which the flora does not occur normally, such as the lungs or the skin, would require this factor and, in addition, the introduction of the flora, by aspiration or otherwise from mouth or throat into the lung, by tooth injury or otherwise to the subcutaneous tissues. In the last instance, the trauma of tooth injury may itself supply all the needed tissue damage, as traumatization with the injection

needle does in the guinea-pig. On the mucous membranes, however, such single traumatic experiences evidently do not serve to establish infection, perhaps because the mucous membranes are more resistant to the fusospirochetal flora than is the skin. Thus, as indicated above, attempts to transfer infection to the mouth do not succeed despite accompanying mechanical injury. Likewise, it is well known that wounds of the mouth nearly always heal uneventfully, as do even the areas of trauma of the gingivae regularly induced by second-year dental students in their early attempts at gingival curettage.

Vincent's infection may be classified, under this hypothesis, with other fusospirochetal diseases, oral and extra-oral, in the category of endogenous infections, which would include endocarditis due to *Streptococcus viridans;* peritonitis, cystitis and other infections due to the colon bacillus or other indigenous parasites of the intestine, and probably actinomycosis and the ill-defined group of diseases associated with the anaerobic streptococci and the genus *Bacteroides.* All these diseases appear to be caused by micro-organisms that occur normally on the mucous membrane, which ordinarily appear to do no harm, but which acquire the ability to produce disease as a result of circumstances more or less distinct for each disease entity. As a group, these are non-communicable diseases; and if Vincent's infection is one of them, it too would appear to be non-communicable. As we have seen, all the data reviewed in this paper are consistent with this view; the circumstances of the etiology and pathogenesis of Vincent's infection suggest that it is probably not communicable, and there seems to be no clear or convincing direct or other evidence of the alternative.

However logical this hypothesis may appear, demonstration that Vincent's infection is not communicable is also lacking. We are not justified, on the basis of logic and negative evidence alone, in relaxing all sanitary precautions in the handling of Vincent's infection among either civilian or military groups. Logic and negative evidence, however, suggest that elaborate precautions may be superfluous, and hence wasteful and inefficient. It is therefore necessary that we look still further for positive and convincing evidence on this question. Such evidence does not seem to be available, but it should not be difficult to obtain.

THE NEED FOR AN EPIDEMIOLOGIC STUDY OF VINCENT'S INFECTION

It may be predicted safely that additional outbreaks of Vincent's infection will occur among our armed forces during the course of the current war. Present-day emphasis on adequate nutrition and good hygiene may be expected to minimize them, probably to make them less severe; but our knowledge of this disease is not yet sufficient, even though all of it were applied, to warrant even the hope that the disease will not occur at all. Outbreaks in army camps or similar situations may therefore be looked for, and one of them ought to be made use of for an epidemiologic study to provide the information upon which a standard method for the sanitary control of the disease could be based thereafter.

Accounts of earlier studies of this kind, as described in this paper, make it evident that something more is needed than has been done in the past. An elementary requirement might be the careful tracing of histories of contact: of the occurrence of the disease in men who sleep under the same roof, eat at the same table, etc.; and records of the common use of dishes, towels, toothbrushes, pipes. Each case could be traced back as far as possible, and those that give no history of contact should be recorded with the others. But this approach, even though it were followed with meticulous care, might yield an inconclusive result because of the difficult conditions set by

the characteristics of Vincent's infection. A deliberate experiment to determine the effectiveness of isolation, with adequate control, would be a better method.

A detailed plan for such an experiment could be formulated only in the field, in accordance with field conditions. The following is a generalized suggestion. The experiment presupposes the occurrence of a group of cases of severe Vincent's infection in an army camp provided with adequate medical and dental service, and comprising more than one barracks or otherwise lending itself physically to the separation of two groups of men. In one barracks or separable unit, strict isolation would be applied. All cases would be removed from the unit as they appeared, and isolated as rapidly as possible, or at all events kept strictly from contact of any kind with the unaffected men remaining in the unit. The conservative recommendations of Elmendorf (1921) might be used as a practical guide to procedure of isolation. In the other barracks or unit, seeded if necessary with as many acute cases as appeared initially in the first barracks, no isolation whatever would be applied, the disease being handled as though it were entirely non-communicable. Except for these provisions for isolation or no isolation, the treatment and handling of the men would be the same. It would, of course, be essential to keep the two units from contact with each other. If this experiment were carefully set up and conducted without prejudice, it should within a few weeks provide a conclusive answer to the title question, Is Vincent's infection a communicable disease? There is little reason to believe that the experiment would be dangerous. If the non-isolated group were not too large, and precautions were taken to prevent the possible spread of infection beyond its limits, no serious epidemic could result. The data in this paper indicate that such an epidemic would be unlikely even though the disease were to prove communicable in some degree. It seems probable, furthermore, that the individual cases would not be so severe, under current dietary and hygienic conditions, but that good routine treatment could be expected to handle them effectively. The risk, on the whole, seems a far less serious one than would be warranted by the practical importance of the information to be gained.

SUMMARY

It has not been demonstrated that Vincent's infection is a communicable disease. The evidence of man-to-man transmission which has been reviewed is entirely circumstantial, and can all be interpreted under the hypothesis that Vincent's infection depends for its development on predisposing conditions such as dietary deficiency, which permit invasion of the tissues by a group of micro-organisms normally limited harmlessly to the surface of mucous membranes. Current knowledge of the etiology and pathogenesis of this disease supports the hypothesis. It is nevertheless clear that infection plays an important part in the disease, and the facts also fail to demonstrate the alternative, that Vincent's infection is not communicable. Since the disease has been prevalent among soldiers, and is likely to become so again, it is important that the question be answered in order to justify isolation (or failure to isolate) and other sanitary precautions in handling outbreaks. A plan for an experiment to elicit the needed information, to be done at an army camp on the occasion of an outbreak of Vincent's infection, is therefore suggested.

BIBLIOGRAPHY

(Anonymous.) *Brit. D. J.*, 72:1, January 1, 1942.

APOSTOLIDES, A. G.: *J. Trop. M. Hyg.*, 25: 81, April 1, 1922.

APPLETON, J. L. T.: Bacterial Infection. Philadelphia: Lea & Febiger, 1933, p. 581.

BARNES, MARGARET N., and BIBBY, B. G.: Infections Caused by Human Tooth Wounds. J.A.D.A., 26:1163, July 1939.

BERGERON, E. J.: De la Stomatite ulcéreuse des Soldats, Labé, Paris, 1859.

BOUTY, R. J. C.: *Brit. M. J.*, 2:685, November 24, 1917.

BOWMAN, F. B.: *Proc. Roy. Soc. Med.* (Med. Sec.), 9:51, January 1916.

BRAMS, J., and PILOT, ISADORE: *Arch. Dermat. & Syph.*, 7:429, April 1923.

BURCH, R. J.: *D. Bull.* (Supp. *U. S. Army Med. Bull.)*, 12:287, 1941.

BURNET, F. M., and LUSH, D.: *Lancet*, 1: 629, March 18, 1939.

BURNET, F. M., and WILLIAMS, S. W.: *M. J. Australia*, 1:637, April 29, 1939.

CADY, F. C.: U. S. Pub. Health Bull. 251, Washington, D. C., 1939.

CAMPBELL, A. R., and DYAS, A. D.: *J.A. M.A.*, 68:1596, June 2, 1917.

CLEWER, D.: *J. Roy. Army M. Corps*, 40: 285, 1923.

CORBUS, B. C., and HARRIS, F. G.: *J.A. M.A.*, 52:1474, May 8, 1909.

COURCOUX, A., and DEBRÉ, R.: *Bull. et mém. Soc. méd. d. hôp de Par.*, 42:297, March 22, 1918.

DAVIS, D. J., and MOOREHEAD, F. B.: *J. D. Res.*, 5:1, March 1923.

DODD, K.; JOHNSTON, L. M., and BUDDINGH, G. J.: *J. Pediat.*, 12:95, January 1938.

Idem: Am. J. Dis. Child., 58:907, October 1939.

ELMENDORF, D. F.: *Mil. D. J.*, 4:138, 1921.

FENSKE, E. L.: *D. Bull.* (Supp. *U. S. Army Med. Bull.)*, 12:70, April 1941.

FULLER, C. R., and COTTRELL, J. C.: *J.A. M.A.*, 92:2017, June 15, 1929.

GOADBY, KENNETH: *Lancet*, 1:959, May 6, 1916.

GOODROW, W. E.: Vincent's Infection. J.A.D.A., 23:2159, November 1936.

GREENBLATT, R. B., and WRIGHT, J. C.: *Am. J. Syph., Gonor. & Ven. Dis.*, 20:654, November 1936.

GUNTHER, E.: *D. Bull.* (Supp. *U. S. Army Med. Bull.)*, 12:72, April 1941.

VON HAAM, E.: *Am. J. Trop. Med.*, 18:595, September 1938; *J.A.M.A.*, 114:291, January 27, 1940.

KING, J. D.: *Lancet*, 2:32, July 13, 1940.

KOLLE, W.: *Med. Klin.*, 13:59, January 21, 1917.

KRITCHEWSKI, B., and SEGUIN, P.: *Presse méd.*, 26:248, May 13, 1918.

KRONENBERG, E.: *Med. Klin.*, 16:317, March 21, 1920.

LAUGHLEN, G. F.; WARNER, W. P., and HOLMES, H. A.: *Canad. M. A. J.*, 9:345, April 1919.

MCCLARENCE, J. N.: *J. Roy. Nav. M. Serv.*, 27:396, 1941.

MCKINSTRY, W. H.: *Practitioner*, 99:507, December 1917.

MCMASTER, P.: *Am. J. Surg.*, 45:60, January 1939.

MICHIE, H. C.: The Medical Department of the U. S. Army in the World War. Washington, U. S. Govt. Printing Office, 1928. V. 9 (Communicable and Other Diseases), p. 493.

PARDEE, K.; GORDON, F. F., and RILEY, C. V.: *New England J. Med.*, 198:796, May 31, 1928.

PAUL, E.: *Deutsche Monatsschr. f. Zahnheilk.*, 28:22, 1910.

PETERS, W. H.: *J. Infect. Dis.*, 8:455, June 1911.

PILOT, ISADORE, and KANTER, A. E.: *J. Infect. Dis.*, 32:204, March 1923.

PROSKE, H. O., and SAYERS, R. R.: *Pub. Health Rep.*, 49:839, July 20; 1212, October 12, 1934.

REASONER, M. A.: *New York State J. Med.*, 27:767, July 15, 1927.

RECKORD, F. F. D., and BAKER, M. C.: *J.A.M.A.*, 75:1620, December 11, 1920.

ROSEBURY, THEODOR: Dental Science and Dental Art (S. M. Gordon, editor). Philadelphia: Lea & Febiger, 1938, p. 415.

ROSEBURY, THEODOR, and FOLEY, GENEVIEVE: Experimental Vincent's Infection. J.A. D.A., 26:1798, November 1939.

SCHOETZ, W.: *Med. Klin.*, 16:151, February 8, 1920.

SCHROFF, JOSEPH, and BARTELS, H. A.: *J. D. Res.*, 9:81, April 1929.

SCHWARTZMAN, J., and GROSSMAN, LOUIS: *Arch. Pediat.*, 58:515, August 1941.

SCOTT, T. F. M.; STEIGMAN, A. J., and CONVEY, J. H.: *J.A.M.A.*, 117:999, September 20, 1941.

SEMPLE, D.; PRICE-JONES, C., and DIGBY, L.: *J. Roy. Army M. Corps*, 33:217, 281, September, October 1919.

SMITH, D. T.: *J. Infect. Dis.*, 46:303, April 1930; Oral Spirochetes and Related Organisms in Fuso-Spirochetal Disease, Baltimore: Williams & Wilkins, 1932.

SMITH, R. E., and DUSINBERRE, A. B.: Clifton M. Bull., 20:24, January 1936.

TAYLOR, F. E., and MCKINSTRY, W. H.: *Brit. M. J.*, 1:421, March 31, 1917.

VESZPREMI, D.: *Zentralbl. f. Bakt.*, Part 1 (Orig.), 38:136, 1905; 44:332, 408, 515, 1907; 45:15, 1908.

WEBSTER, J. F.: *D. Rec.*, 61:319, November 1941.

RÔLE OF DENTISTRY IN THE WAR EFFORT

By COMMANDER C. RAYMOND WELLS* (DC) USNR, Washington, D. C.

IT is a privilege to be here as a representative of Brigadier General Lewis B. Hershey, Director of the Selective Service System, and of Colonel Leonard G. Rowntree, Chief of the Medical Division of the Selective Service System, and I bring to you the greetings of these two outstanding government executives. They each hope that your deliberations during this week will result in the further advancement of the science of dentistry and that those deliberations will consider the dental conditions of the public as revealed by the Selective Service. The problem should receive consideration that future generations may be benefited by a program insuring dental fitness and, in turn, more physically fit bodies.

Dentistry has made many advances since the World War of 1917-1918, educational, scientific and technical. I do not need to review all of the advances because you are familiar with them, yet they should be recalled and considered because they have been of inestimable benefit to the public. There is one that seems to have been misdirected: the dental application of and interest in the theory of focal infection. The reason for leading the discussion with this is to consider just how it affected the dental fitness of our citizens today, as revealed by the Selective Service.

Twenty years ago, Charles H. Mayo said, in effect: "The next great advance in preventive medicine will come from the dental profession." Dr. Mayo's words were significant because, basically, he was thinking of the part that dentistry must play in promoting the health of the people by preventing or eradicating dental infection.

The dental profession accepted the apparent challenge perhaps more with action than with investigation and more with forceps than with preventive and restorative measures. The physician encouraged the dentist by insisting that forceps be used, and thus many teeth, so valuable to appearance and digestion, were removed on flimsy diagnosis and in the hope that spectacular recovery of the patient would result. The public soon came to believe that the teeth were responsible for most bodily ills. In many cases, the physician would not examine or prescribe for the patient until the dentist had operated in some way; and if radical dental surgery did not effect a cure, he would probe further in medical diagnosis, to ascertain other possible causes for the complaint.

The words "dead teeth" were freely used by members of both professions. The dental profession devoted little time to research on the problem of saving pulpless teeth. Instead, remarkable advances were made in surgical technic and prosthetic restorations to compensate for lack of a fundamental approach to the subject envisioned by Dr. Mayo.

Oral surgery and prosthetic dentistry have developed a high degree of perfection. Operative dentistry has been perfected to the point that today tooth prep-

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Read at the Second General Session of the Seventy-Eighth Annual Midwinter Meeting of the Chicago Dental Society, February 23, 1942.

aration for fillings, inlays and crowns represents the highest form of dental skill. Yet all these advances in technic revolve around the restoration of teeth, which, of necessity, is expensive.

It is true that dentistry has kept alert and abreast of physiologic and biochemical research on the prevention of caries and dental disease. Of this I am intimately aware and appreciative. I have made and directed many such research studies and confidently believe that, in the distant future, dental caries can be prevented. The dental profession is now giving and must continue to give more concentrated study and research to these preventive phases, but they take time.

The human body does not respond to treatment rapidly, nor is the human body under perfect control because its responses are unpredictable and independent. It can change a biochemical process by becoming fatigued, by eating a candy bar or drinking alcoholic beverages or some other chemical incompatible. The problem of dental caries and its cause and prevention will be solved just as will the problem of other pestilences affecting mankind, but we now have a war to win and time is important. There is a catchy phrase, somewhat as follows: "The man who relaxes helps the Axis." Not having any rapid or positive way of preventing dental caries, it is, therefore, the duty of the dental profession to meet the situation as it finds it today and to correct the condition by stopping its progress through practical restorative operative dentistry, with the extraction of carious teeth reduced to the minimum and the insertion of fillings and inlays accelerated to the maximum. The main goal of the dental profession is to save teeth, not to remove them.

The practice of operative dentistry is an exacting and ofttimes tedious process. It calls for a precise and thorough technic. Its goal is the insertion of a filling that will restore the teeth to shape, form and function, and though it may not give such satisfaction to the operator or the patient as does the practice of surgery or prosthetics, it restores to health and original function an organ of the human body.

Now we know that an individual is the master of his own body and that it is he who finally determines what service is to be rendered. We are aware of the fact that the individual can demand a filling or an extraction; and since he must pay the fee, he will naturally fit it in with his own current resources. Undoubtedly, the patient has preferred automobiles and other luxuries to dental care, and too often he seems to have preferred extractions to dental restorations, because of fear, lack of time or economic necessity.

If teeth are missing, a physical handicap results, and a patient with few or no natural teeth is considered a dental cripple. The public must be encouraged to save their teeth, and the dental profession should stress more forcefully in the future, the importance of saving them.

REHABILITATION

Being concerned with the number of rejections of drafted men for minor physical defects, President Roosevelt, during a conference with the Secretary of War, the Chief of Staff, the Director of the Selective Service and the Chief of the Medical Division of the Selective Service, October 9, 1941, stated in effect that he desired to have registrants with remediable physical defects rehabilitated so that they could take their places with others in the armed forces. He estimated that of 188,000 men rejected for dental defects, 100,000 could be made available for military service by the correction of these defects.

In this program, the local board examining dentist and the dentist on the medical advisory board, together with the chairman of the local board, will

play an important part in advising the state director of the Selective Service as to those who can be rehabilitated and to what extent. It is contemplated that services will be rendered by competent dentists in the community, on a contract basis, with the choice of dentists given the registrant, so far as is practical.

The rehabilitation will be extensive enough to permit acceptance of the registrant by the armed forces. It is expected that dentists of the community will render the highest type of dental service and that the registrant will be accorded the same treatment that would be given any private patient.

The details of the program are not quite ready for release, but it is believed that the public and the professions will be satisfied with the plans.

Authorization of the rehabilitation program in Virginia and Maryland marked the beginning of a long-planned nation-wide rehabilitation campaign, and when the results of the pilot tests are evaluated, a date for the inauguration of the national program will be announced.

As one of the first steps in the test programs in Maryland and Virginia, the director of the Selective Service of each state will submit to national headquarters lists of physicians and dentists who are qualified to participate in the campaign for the correction of minor physical defects of registrants.

When the program is announced in your state, any physician or dentist can make application to be designated as qualified to assist in the rehabilitation program. Physicians and dentists not already designated and who are named by registrants as their choice of dental or medical practitioner, and other physicians and dentists who wish to take part in the program, will then request the necessary application form from the local board so as to obtain authority to treat registrants.

The national headquarters is confident that physicians and dentists will cooperate to the fullest in rendering professional service to registrants in order to make as many men as possible available for defense.

The program of rehabilitation is designed solely for registrants. The Selective Service, being a procurement agency for the armed forces, and in pursuance of the President's plan, is concerned now in rehabilitating men that can be made fit for general military service.

The dental profession can cooperate in this great war effort by educating the public in preventive dentistry, which will tend to promote the conservation of natural teeth, thereby improving the health and appearance of our citizens and making them fit for any service required by the nation.

THE NEEDS FOR DENTISTS

Both the Army and the Navy are expanding their dental programs as the personnel increases, and so will the dental corps. As fast as Army camps and naval stations are developed and ships fitted, dental officers are assigned. This means that a great many dental officers are serving in the armed forces in various places in this country and in other parts of the world, at stations and camps and on board combat and auxiliary ships. Where the American Flag goes, a member of the dental profession will be. Army and Navy dental officers were under fire at all places attacked by the Japs. They have felt the onslaught of battle and are helping to defend the Flag and their countrymen at home. At the front, on land or sea, in battle, they serve as auxiliary medical officers and as such assist in saving life.

Civilian dentists who are mentally, morally, physically and professionally qualified may be commissioned in the dental corps of the Army, Navy or Public Health Service, provided vacancies exist.

The young dentist, if commissioned, enters the Army as a first lieutenant, the Navy as a lieutenant (junior grade) and in the Public Health Service with an equivalent status. His first assignment will likely be in an Army camp or naval training station, where he will be on duty with medical and dental officers. Here he gets his first training as a dental officer. He becomes indoctrinated with the ways of military and naval life, which differ so much from civilian practice. In the services, he may have independent duty such as that of camp dental surgeon or the ship's dental officer. He thus is an ambassador for dentistry. On his conduct will depend his fellow officers' and the enlisted personnel's estimate of dentistry and dentists. If he is a good officer, a good dentist, a gentleman and a good shipmate, dentistry will be regarded favorably. The profession expects every dental officer to represent it in a manner that will reflect credit on the individual officer and the profession and to continue to treat each patient as he would those in his private practice. Every patient thus treated will be a friend.

The armed forces will need an increasing number of dentists, and as the officers' reserve becomes exhausted, a further call will be made upon qualified civilian dentists. The Army requires three dentists for every 2,000 soldiers, while the Navy requires two dentists for every 1,000 enlisted men of the Navy and the Marine Corps. Thus, as the armed forces expand, so will its respective dental corps.

PROCUREMENT AND ASSIGNMENT SERVICE

In order to determine where qualified physicians, dentists and veterinarians can render the greatest professional service to the nation at this time, the President, by executive order, has formed the Procurement and Assignment Service, under the Office of Defense Health and Welfare Services. This service was formed primarily for the purpose of gathering and making available information with respect to the supply of qualified practitioners in the fields of medicine, dentistry and veterinary medicine, with a view to securing the most effective allocation of medical manpower as indicated by the requirements of the armed forces, civilian needs and industrial medicine.

To work with the headquarters of this service in Washington, a committee has been organized for each corps area in the United States. Each committee will consist of five physicians, two dentists and one veterinarian. The committees have been accepted as advisors to the nine corps area surgeons, to the naval district surgeons and to the regional medical officers of the Office of Civilian Defense, and will operate not only through the subdivisions of the medical, dental and veterinary associations, but also with the profession at large, securing information and giving advice.

When considering the classification of any registrant who is a qualified physician, dentist or doctor of veterinary medicine, the director of the Selective Service desires that local boards, through the state director, shall consult the Procurement and Assignment Committee for the corps area for information as to the availability of qualified physicians, dentists and doctors of veterinary medicine in the community. This information shall be considered by the local board in determining the registrant's classification. The executive order referred to in no way affects the authority of the Selective Service System to classify registrants. The procedure has been established for the purpose of making such information available for local boards.

Dentists between 36 and 55 years of age inclusive (except in certain pay positions) are not, as yet, being considered for commissions as dental officers in the

armed forces because it is felt that the rigors of general military and naval service require the services of younger dental officers. Separation from home and family is a much greater problem for dentists in the older age group than for younger men. While the experience of the older men is invaluable and will be utilized as the dental corps expands, the older Dental Reserve Corps officers are now able to furnish this experience and supervision. The need for dentists, as I have said before, will become acute as time goes on, and then the older dentists will be asked to serve in the armed forces.

State boards of dental examiners should consider holding examinations on the same date throughout the entire United States, thereby assisting the nation by relieving the local boards of the necessity for granting prolonged deferments to young graduates to enable them to take the state board examinations on many different dates. The armed forces would be assured of having a reserve of young licensed civilian dentists to draw upon for immediate service. It is necessary for dentists who desire to enter the Reserve Auxiliary Corps of the armed forces to have state board licenses. Those in the dental corps of the regular services are not absolutely required to have a state board license, since the regular corps of the armed forces gives its own entrance examination, which is equivalent to that of a state board. However, possession of a state board license would be an additional professional qualification. The regular dental corps examination does not give a dentist the right to engage in the civilian practice of dentistry in states throughout the country, because not all states have reciprocal agreements with the armed forces.

Civilian dentists of all ages who desire to enter the dental corps of the armed forces should apply by letter to the Procurement and Assignment Service, Office of Defense Health and Welfare Services, 601 Pennsylvania Ave., Northwest, Washington, D. C.

Of course, if the need for dentists in the armed forces exceeds the voluntary response (and I cannot conceive of such a state) and they have not otherwise entered the military service, it is obvious that such requirements will have to be met through the Selective Service.

PATRIOTISM OF DENTISTS

The response of members of the dental profession for duty with the armed forces has been satisfactory and gratifying. Since only a limited number of commissions in the Army are available for qualified dentists at this time, all the dentists who have applied cannot be accommodated. With many Dental Reserve Corps officers not as yet called to active duty, and a substantial number of young dentists being inducted through the Selective Service and commissioned if qualified, the Army appears to be meeting its current needs.

The number of dentists needed for the Naval Dental Corps is much smaller than for the Army, and but few additional dental officers are needed at this time. It becomes necessary, therefore, for those older dentists desiring commissions in the dental corps to continue civil practice until more vacancies occur in the armed forces. The patriotism of members of the profession far exceeds the need for their services at the present time, all rumors to the contrary notwithstanding. If you could but review the many letters we have received from dentists of all ages, indicating a willingness to serve the nation at this time, you would be proud of your profession.

CIVILIAN DENTISTS

The dentists who are not physically qualified or whose service cannot be spared from their present location will be privileged to serve the nation in other important and effective ways. It is true,

they will not wear a uniform, but their contribution to the health and safety of the nation will be as necessary as if they were members of the armed forces.

Civilian dentists will have a double duty to perform in rendering dental treatment to defense workers and to all other citizens and to children, all of whom are essential to national defense. Dentists can serve as examining dentists for local Selective Service boards and medical advisory boards, as teachers, first-aid workers, air raid wardens and assistants, as members of disaster teams, as research workers and as regular purchasers of defense bonds and stamps. It is hoped that members of the dental profession will respond to the limit of their financial ability in buying defense bonds and stamps. Your major share in victory will be your response to this appeal.

A letter which appeared in a recent issue of the *New York Times,* a "Duty for Citizens" aptly gives an answer to "What can I do in this emergency?" Each of us can at once shake off the chains of our fixed thinking and take the words realistically. Each of us can take individual steps to boost the general morale, doing every job better, putting personal and household affairs in order, keeping healthy, avoiding excesses, conserving needed material and keeping alert to local affairs, with cool and constructive criticism.

DENTAL SOCIETIES

The dental society will play an important rôle in the war effort by continuing lectures and postgraduate courses for the members and by advising various community, municipal and state agencies on dental problems, and in preserving the high ideals of American dentistry. The societies may be called upon to furnish lists of its members for the defense effort according to age and specialty groups. Probably no group of dentists in civilian life will be called upon to contribute more than will the officers and committee members of our various dental societies.

DENTAL SCHOOLS

Local boards will consider the deferment of those students who are making satisfactory progress and the need for their continuance so that the flow of dentists may continue. The dental schools, like the medical schools, have responded with a rearrangement of a traditional four-year course of study to a three-year course of intensive training with the schools in session eleven months of the year. Such an accelerated program will provide for the need of services of trained dentists in as short a time as is physically possible. It is hoped that, in the accelerated program, the quality of dental education will continue. The faculty members and students both have a serious task to perform. Teachers and students with this increased pace will utilize their physical abilities to the limit. If they can be inspired with the thought that this is war and that their contribution is worthy and recognized, they will meet the situation. The deferment of dental students represents true selection. It is not for their own benefit, but for the benefit of the nation. They can best serve in the war effort by continuing their present assignment now and entering the armed forces when they have perfected their skill in dentistry.

Because time will prove the need for more practicing dentists, more women should be encouraged to study dentistry. Women make good dentists and their services should be especially desirable in any prehabilitation program that may be put forth. The schools will undoubtedly be concerned with the following questions: "How fast can we do our job? How well can we do it? And how can we do it without sacrificing the quality of dental education?"

DENTAL HYGIENISTS AND ASSISTANTS

It is essential that the dentist be relieved of all duties whenever and however possible so that he may devote his whole time to treating and repairing carious teeth, replacing lost teeth and other dental operations. Dental hygienists, therefore, should redouble their efforts to relieve the dentist of those duties which the hygienist has been trained to perform and, by more intensive effort, make it possible for the dentist to devote more man hours to other dental operations. Assistants and receptionists can contribute much by effectively handling all of the affairs of the office, and cheerfully, efficiently and speedily caring for patients that come into the office or who await appointments.

It is highly important that the patients who come to the dental office under the proposed rehabilitation plan be given preference, for these are the men who are needed so desperately in our war program, and the speed and efficiency with which they are handled saves time for our armed forces.

DENTAL TECHNICIANS

The dental laboratories unquestionably must receive consideration in order that they may maintain an adequate staff of competent technicians. There are certain key men in every large dental laboratory whose training as dental technicians has taken many years, and it is difficult to replace such men. The Army and Navy will need skilled dental technicians. Dental laboratories, in considering deferment requests for any of its technicians, must differentiate between the necessary and skilled men and the plaster, or biteblock, boy. The dental laboratories should consider the employment and training of more women. Women make good dental technicians, and the employment and development of women in this field will release more manpower to the armed forces.

This communication has been designed to cover briefly, but adequately, the rôle of dentistry in the war effort. It is anticipated that the dental profession will cooperate fully with the government during these critical times. I close this address with the remarks of one of our state directors of Selective Service:

> We are fighting a war to the death, if necessary, and it is more than ever incumbent upon every one to do his duty. Many examining physicians and dentists are acutely aware of the situation and working night and day with the local boards, when necessary. Many others have volunteered to do much more than they are already doing. This is the spirit and determination necessary these days and I know our physicians and dentists will respond to every call without hesitation or reservation.

FAILURE OF CEVITAMIC ACID AS A THERAPEUTIC AGENT IN PERIODONTAL DISEASE

By Leslie J. Fitzsimmons, D.D.S., East Orange, N. J.

DURING the last twelve months, the scientific literature of dentistry has carried numerous articles extolling the merits of cevitamic acid. In journals of medicine and dentistry, the impressive bibliographies accompanying data on cevitamic acid substantiated our acceptance of the value of this substance as a therapeutic weapon against scurvy and subscorbutic conditions.

It is fast becoming the rule and not the exception for physicians and dentists who find a need for vitamin C to prescribe the synthetic cevitamic acid tablet. In an earlier paper,[1] the reason for this preference of the synthetic over the natural source was well founded.

It may be the general rule for those occasionally prescribing cevitamic acid that improvement of the oral tissues is noted. It may be the exception to those who as a routine practice advise the use of cevitamic acid that a few cases have not responded. These are the cases of failure in which the therapeutic claims for the substance proved to be of little help. Accurate clinical observation and frequent reference to the literature on the subject of cevitamic acid will shed light on the possible reasons for failure.

The number one reason might be called "the rule of hit or miss prescribing." Whereas the usual prophylactic dose of cevitamic acid has been successful on the average, the case that failed may have called for a quantity well up in the therapeutic scale. Dosages given on the labels of popular brands of cevitamic acid tablets are in the prophylactic range.

The case in question perhaps needs much more medication to reach the curative or therapeutic level. To save time and the embarrassment of changing the dosage, it is well that the internist be called to determine by urine and blood plasma tests the rate of excretion of vitamin C, from natural food intake, or of the ascorbic acid from the synthetic drug. The report of the laboratory will therefore govern the medication for the case in question.

Vitamin C is absorbed in the small intestine[2] and only in an acid medium. When there is an absence of this digestive juice, as is found in achlorhydria, the therapeutic effect of the natural or synthetic substance will be reduced.

The treatment of constipation, a common ailment among those ingesting suppurative material with their food when pyorrhea is present, can be listed as a reason for failure of cevitamic acid therapy. The patients are often daily users of mineral oils to promote bowel movement. Cevitamic acid cannot be absorbed in the intestine which is coated with oil. Elimination of the oral pathosis and the resultant constipation will naturally obviate the use of mineral oil. The efficacy of the drug is thereby increased. Patients using great quantities of acetylsalicylic acid (aspirin)[3] offer potential cases of failure when cevitamic acid is

expected to promote better tone of the mucous membranes.

It has been reported by Ahmad[4] that diets high in protein and fat cause an increased urinary excretion of vitamin C. In this instance, failure may lie in taking a dose of cevitamic acid in the therapeutic range, and the dietary fault is preventing the much desired absorption of the substance. It is being rapidly excreted in the urine and not reducing the scorbutic condition. From this lack of absorption, it is seen wise to examine the patient's diet in the manner prescribed in an earlier paper[1] and advise the correct acid-alkaline ash balance. A diet that leans toward the alkaline will naturally be low in protein and fat.

A failure may be due to improper diagnosis of a supposed scorbutic involvement. There is the possibility that the condition has a cause for which cevitamic acid therapy is not the specific. The tissue may appear to be well-nigh classically perfect for the diagnosis and yet the use of cevitamic acid will not bring about the desired result. We must bear in mind that a streptococcic stomatitis has much the same symptoms as a well-defined scorbutic involvement and must be ruled out of the picture. A retromolar flap, a semi-impacted third molar with a pocket about it, an infected tonsil crypt—any one of these may harbor a streptococcic infection, which may be radiating to the gingivae. The focus must be treated before the expected result from cevitamic acid therapy will be forthcoming.

A blood dyscrasia, such as mononucleosis, has been found to resist large doses of cevitamic acid. There is a focus of infection in this type of case and the help of the internist will be found invaluable.

There have been times when the clinician found that large doses of cevitamic acid given throughout the menopause brought improvement in tissue tone for awhile, and then suddenly the tissues suffered a temporary return to the original run-down state. It is safe to say that this has been observed by leaders in research, and soon the literature will carry their startling findings.

Mild endocrine disbalance, which may manifest itself in the oral cavity of the female as recurrent hypertrophy of the gingival tissue, will not be affected by massive doses of cevitamic acid.

SUMMARY

The use of synthetic vitamin C or cevitamic acid tablets has increased materially since research has proved their therapeutic efficacy and active element ingredient.

The rule of "hit or miss" must be eliminated. The aid of the medical internist is invaluable.

A clear picture of prophylactic dosage and therapeutic dosage must be kept in mind.

Gastrointestinal disturbances, such as achlorhydria, will prevent absorption of cevitamic acid. An acid medium is required for absorption in the small intestine, which when coated with a lubricating oil, e.g. to correct sluggish bowel movements, cannot absorb cevitamic acid.

Complete knowledge of the weekly food intake is necessary. The diet rich in protein and fat causes increased urinary excretion of the vitamin and will prevent the desired change in the scorbutic condition. We must advise a diet that shall lean toward the alkaline ash side.

Streptococcic stomatitis may be the predominating cause for the condition of the soft tissues. This condition must be recognized and the focus detected and eliminated before cevitamic acid will be of any benefit.

Blood dyscrasia, such as mononucleosis, must be determined by the physician practicing internal medicine and the focus removed lest the large doses of cevitamic acid be of no use.

During the menopause and in mild

endocrine disbalance in the female, massive doses of cevitamic acid have been found to be of little permanent value. However, in the former condition, when the usual monthly period has passed, the tissue again shows better tone.

CONCLUSION

Cevitamic acid therapy, like all therapy, is fraught with the danger of failure. Those who would prescribe this drug to improve the tissue tone in periodontal disease should have a complete knowledge of the obstacles which may prevent satisfactory results.

BILIOGRAPHY

1. FITZSIMMONS, L. J.: Vitamin C Deficiency, Cause of Periodontal Disease. J.A.D.A., 30:76, January 1941.

2. ZILVA, S. S.: Ascorbutic Acid Content of Intestine of Guinea Pig. *Biochem. J.*, 39: 100, November 1935.

3. DANIELS, AMY L., and EVERSON, GLADYS J.: Influence of Acetylsalicylic Acid (Aspirin) on Urinary Excretion of Ascorbic Acid. *Proc. Soc. Exper. Biol. & Med.*, 35:20, October 1936.

4. AHMAD, B.: Observations on Excretion of Vitamin C in Human Urine. *Biochem. J.*, 30:11, January 1936.

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MIGRAINE AND THE CLOSED BITE

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As far back as twenty years ago, dentists were aware of the deleterious effect on hearing, in many cases, from changes in the temporomandibular joint. Since, then, histologic research on the temporomandibular joint shows that marked changes are constantly taking place in the meniscus of the condylar joint, as well as other tissues surrounding the condyle head, and in the glenoid fossa. These changes are the result of closing of the bite due to wear, loss of teeth, etc.

We are all familiar with the less serious pathologic conditions arising from the disturbance of normal anatomic relations by closing of the bite; namely, various symptomatic neuroses of the face and jaws, headache, fatigue, a feeling of discomfort, etc. Another and more serious pathologic condition which I have reason to believe results from the above-mentioned disturbance is migraine.

From Cecil's textbook of medicine, I quote: "Migraine is a periodic cephalalgia characterized by absence of any local lesion which might occasion headache, and peculiar as regards the visual oculopletic symptoms and psychic phenomena which may accompany it." The attacks are periodic, and nervous influences are important in precipitating this condition. The disturbance frequently disappears when the nervous factor is removed. This is shown in the case of the man who has severe headache when business is bad, but, as soon as business picks up, recovers.

However, reflex cranial pains often result when the temporomandibular joint functions under pressure. Undue pressure may be exerted in any of the excursions of the mandible. The resulting pains may have all the signs and symptoms of true migraine headache, and we must now recognize the closed bite as a definite etiologic factor in migraine.

Let me cite a typical case of migraine headache:

Mrs. G., aged 42, had suffered for twenty-

two years from migraine headaches, which came on after a vague feeling of impending malaise. Severe pains would then develop, sometimes suddenly, sometimes gradually, usually across the forehead or between the eyes. Less frequently, they were confined to one side of the head. Very often, there was zigzagging of the room and occasionally flashes of light. The patient almost abstained from eating, owing to nausea. The headaches came on approximately three times a month and lasted for an average of five days. The patient was hypersensitive to noise during these attacks. She wore an upper anterior partial denture and a lower posterior partial denture, which had been changed many times in the last twenty years.

In reconstructing the case and for the purpose of improving the appearance and balancing the occlusion, I opened the bite approximately 6 mm. in the anterior region. I deduced that the bite had been in closed relationship for at least the twenty years or more that the migraine headaches had been present. The patient now has complete oral comfort with the new bite-raising appliances. The migraine headaches started to improve immediately, the last one, of only one day's duration, occurring two months after the partial appliances were inserted. It is now more than one year since the patient had any sign or trace of migraine headache or cranial discomfort.

Another case:

Mr. S., aged 59, had suffered from migraine headache for ten years. There was occlusal abrasion present almost to the point of pulpal exposure. The patient wore a lower partial denture and six upper teeth supported two large fixed bridges. In reconstructing the case, I extracted the remaining upper teeth and opened the bite 4 mm. with the full upper denture. Three months later, I remade the upper denture and opened the bite an additional 4 mm. The migraine headaches stopped after the first upper denture was made, and it has now been seven months since any sign or trace of migraine has been evident.

Although we are cognizant of the fact that the wearing down of the occlusal surfaces of the teeth usually brings about changes in the temporomandibular joint as noted in the foregoing, we must also realize that it is difficult for the general practitioner to ascertain the exact time for restoration of the vertical dimension. This is notably so when a number of years have elapsed since the bite has been in closed relationship, and during this time Nature has endeavored to adapt the tissues to the changed and changing conditions. In many cases, the permanent teeth may erupt in closed bite relationship owing to early loss of the deciduous teeth, the practitioner's task of determining the normal vertical dimension then becoming even more difficult. Therefore, there is a pressing need for thorough diagnosis before treatment for the correction of closed bite.

There are many dangers involved, and much harm can be caused, in opening the bite too much. The operator may cause neuroses of the face and jaws that are more severe and more troublesome than the evil that he attempts to remedy. If the occlusion is not perfectly balanced, there may be constant trauma, which may result in a severe case of periodontoclasia. The greatest danger of all is that one may try to fool oneself; a danger that should not be minimized in diagnosing a case. The greatest service that we can render a patient is to refrain from undertaking and promising the impossible.

SUMMARY

Restoring lost vertical dimension may have very favorable results in cases of migraine headache. Care must be taken to have the occlusion balanced, and normal centric relationship restored, and, above all, the bite should never be opened too far.

1325 Grand Concourse.

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L. PIERCE ANTHONY, D.D.S., Editor

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DENTAL HEALTH SERVICE IN THE NAVY

THE need for definite enlargement of the Dental Corps of the Navy to meet the requirements of the present war emergency has directed attention from various dental quarters to the desirability of elevation of the status of the head of the Navy Dental Corps to a parity with that of the Army Dental Corps and of the other corps of the Army and Navy.

In the past, the most productive approach to improving the status of the Dental Corps in the armed forces has been made through legislative channels, and initiated and prosecuted through the Committee on Legislation of the American Dental Association.

For more than a year, efforts have been made to inaugurate a movement that would have as its objective a proper elevation in rank of the head of the Navy Dental Corps. After some preliminary skirmishes, mostly individual, in this direction, efforts were directed to enlisting the services of the Committee on Legislation toward obtaining appropriate recognition of dentistry in the Navy, a matter which, we are informed by the chairman of the Committee on Legislation, Dr. A. B. Patterson, has engaged the attention of the committee for several years, although the committee has refrained from action or recommendation on the matter for reasons which seemed wise.

Now, however, it seems wise to the committee, and timely too, that the American Dental Association request the Navy authorities to consider a proposal that the rank of Rear Admiral, Assistant Surgeon General, be established in the Navy Dental Corps. Accordingly, at the midwinter interim meeting of the Trustees, held in Chicago in February, the Committee on Legislation recommended to the Trustees that efforts be inaugurated with the purpose of improving the status of the Navy Dental Corps as befits its present importance as a health service to the Navy.

The recommendation was favorably received by the Trustees and referred to the Contact Committee on Legislation, which committee, after due deliberation, reported back to the Trustees as follows:

> The Committee approves the recommendation that a communication be addressed at once to the Secretary of the Navy by the President of the American Dental Association, this letter to be sent also to the Surgeon General of the Navy, informing them of the need for the appointment of an Assistant Surgeon General in the Navy Dental Corps, with the rank of Rear Admiral. Such a letter to request a conference to be arranged by the Committee on Legislation between their offices and the President of the American Dental Association together with representatives of the Committee on Legislation.

As supporting background for the suggested effort by the Committee on Legislation, we present a rather sketchy history of the establishment and development of dentistry as a health service in the armed forces of the nation.

The first legislation relating to dental service in the armed forces of the United States, enacted by Congress, February 2, 1901, provided for a probationary dental corps for the Army comprising thirty members, employed as contract dental surgeons. After a long and trying period of probation in a more or less humiliating relationship, but one which enabled the "contract surgeon" to demonstrate beyond doubt to the military branch of the government that dental service as such was most desirable in the ranks, the provision for dental service was amended.

In March 1911, legislation was enacted authorizing a commissioned rank of first lieutenant for members of the Dental Corps, but under stipulated conditions; namely, the privilege of rendering dental health service to the Army almost beyond physical capabilities, and with a rank subordinate to all commissioned officers of the Army.

The National Defense Act of June 1916 provided increased rank up to and including major; and finally the legislation of October 1917 granted the dental officers equal status with officers of the Medical Corps.

This act of 1917, the greatest legislative accomplishment in the history of the profession, did much to hasten recognition of dentistry not only in the Army, but also in the allied professions and among the public.

August 22, 1912, Congress enacted legislation, following the lead of Army dental legislation, authorizing the establishment of a Naval Dental Corps, the original appointments to be made in the rank of lieutenant, junior grade.

Through legislative progression, we have attained for the Army Dental Corps head the rank of brigadier general and for the Navy Dental Corps head the rank of captain, and it is our belief and contention that the chief of a corps of the importance and value of the Navy Dental Corps should have rank equivalent to the chiefs of other corps of the Navy.

The Engineer Corps is comprised of only 110 officers, and a chief with the rank of admiral. The Construction Corps, up to one year ago, comprised 300 officers with two rear admirals. The Supply Corps comprises 800 officers, with two rear admirals. The Medical Corps, with 950 officers, until recently, had four regular rear admirals, three temporary rear admirals and a surgeon general. The Navy Dental Corps comprises 430 officers and 2,500 in reserve, with a captain as the ranking head. As will be seen from these figures, the Navy Dental Corps is the third largest corps of the Navy. As a corps, it is separate and distinct from the Medical Corps of the Navy, but, in the bureau organization and for purposes of administration, it is a part of the Medical Department and depends on the medical department for its appropriation.

Pursuant to the recommendation by the Committee on Legislation, the President of the American Dental Association, Dr. Oliver, arranged for a meeting with the Surgeon General of the Navy to discuss the matter of the status of the chief of the Dental Corps. The meeting was attended by President Oliver, President Elect J. Ben Robinson, A. B. Patterson, and Sterling V. Mead, members of the Committee on Legislation. The committee was cordially received by Surgeon General McIntire, who was in hearty agreement with the main proposal and gave assurance of his approval of the project.

The unusual expansion now taking place within the armed forces requires large numbers of dental reserve officers, training schools for technicians, a great number of additional dental clinics and enormous quantities of supplies and equipment, and thus has thrown an additional burden upon the present dental division, but the matter has been handled by

the present officers detailed to that division in a manner reflecting much credit on the dental profession.

The acting chief of the Dental Division in the Navy Bureau of Medicine is appointed from the captains of the Corps, but without temporary advance in rank. He is in full charge of the Dental Corps affairs under Surgeon General McIntire, but he does not have sufficient rank or seniority to meet other chiefs of the bureau on an equal footing when matters of corps policy are concerned.

No one argues the value of dental health service in the Navy. That it is essential and necessary to the health and welfare of the Navy has been amply proved through its record of service from "contract days," through the several developmental stages, up to its present high character. Nor do we anticipate that objection to the proposal will be made by the Surgeon General or any other member of the Navy Medical Corps.

In the probationary trial period, with practically no social or military status, these dental health pioneers in the contract service undertook the task of demonstrating the value of dental service to the Army and Navy; and how well they succeeded is a matter of history and a record of which the profession is duly proud.

The benefits of dental surgery in reducing the disabilities arising from oral conditions have been made fully evident, and it has also been well demonstrated that the particular oral diseases which the dental surgeon is called upon to treat can best be cared for by one who is trained and skilled in dental surgical technic.

All these considerations reinforce our belief that the time has arrived when the Dental Corps of the Navy deserves and should receive equal ranking status with other Corps of the Navy.

BIBLIOGRAPHICAL

Juvenile Dentistry

By WALTER C. MCBRIDE, D.D.S., F.A.C.D., Associate Professor of Operative Dentistry and Director of Department of Pedodontia, School of Dentistry, University of Detroit; Visiting Lecturer on Children's Dentistry, Postgraduate School of Dentistry, University of Michigan. Philadelphia: Lea & Febiger, 1941.

TWENTY years of successful private practice has qualified Dr. McBride to write a book which will assist the dentist in solving the many problems concerning dental procedures for children. The first two chapters consist of practical information regarding the control of the child's behavior in the chair and the management of the business side of juvenile dentistry. These two chapters alone make the book almost indispensable. Other subjects adequately dealt with are operative

procedures such as fillings and pulp management in deciduous and in young permanent teeth, as well as practical advice to patients concerning diet. There is an excellent chapter on the appliances and methods used to prevent malocclusion.

Dr. McBride has wisely delegated special fields to the specialist, and the contributors have added to the value of the book. Dr. Dwyer has a chapter on physical diagnosis and Dr. Hall on root resection. Dr. Nuckoll's chapter now includes the complete work on deciduous dental anatomy.

The book is well written, using simple terms, and its well-selected illustrations give the reader a clear picture of the many technical procedures involved. It embodies scientific knowledge, making it suitable as a textbook.

The Chemistry and Manufacture of Cosmetics

By MAISON G. DE NAVARRE, Consulting Chemist, Special Instructor in Cosmetics, College of Pharmacy, Wayne University; Technical Editor, American Perfumer and Essential Oil Review; Associate Editor, Proprietary Drugs. Chapter on Federal Food, Drug and Cosmetic Act of 1938 by RALPH J. MILL, College of Pharmacy, Wayne University. Foreword by ROLAND T. LAKEY, Dean, College of Pharmacy, Wayne University. Cloth. 745 pages. New York: D. Van Nostrand Company, Inc. Price $8.

THE Chemistry and Manufacture of Cosmetics is an informative volume dealing with the principles, practices and uses of a great number of cosmetic agents. The book is divided into ten parts: Weights and Measures; Equipment for Small Manufacture of Cosmetic Materials; Principles of Chemistry and Bacteriology Applied to Cosmetic Agents; Preservatives, Antioxidants, Corrosion; Cosmetic Colors; Emulsions; Cold Creams, Powders, Dentifrices and Other Preparations; Physiology of Skin, Scalp and Hair; The Federal Food, Drug and Cosmetic Act of 1938; Appendix and Bibliography.

The present widespread use of cosmetic agents makes a book of this character particularly timely and useful. The clear presentation of the principles involved in the preparation and use of a variety of products should appeal to all who are interested directly or indirectly in cosmetic agents. From the standpoint of both dental and medical practitioners, the attempt to define the functions of cosmetic agents should be welcomed. Illustrative of an enlightened attitude are the following suggestions to manufacturers:

The purpose of a dentifrice is to cleanse the teeth when used in conjunction with a tooth brush.

The simpler the composition, the better. It is easier to compound; fewer incompatibilities will be encountered; inventories may be kept at a minimum and it is easier to determine the effectiveness of the product. . . . The real result of the application of so-called skin foods is in fact lubrication and not feeding. Therefore, such creams may be better called lubricating creams. . . .

Tooth powders and pastes are also subject to excessive claims made in their behalf by their sponsors. It has been commonly alleged that such products will remove tooth stain regardless of its nature. Obviously it would be impossible to remove a stain of permanent character and about all that may be removed by the use of such a product would be an ordinary surface stain. Labeling should be governed accordingly. That they will make *all* teeth whiter is untrue, as teeth are not normally white in color.

The author has put to good use the findings of the Council on Dental Therapeutics on the preparation of material dealing with dentifrices. It is to be hoped that manufacturers and others interested in articles of this class will consider seriously the author's enlightened attitude in respect to these products.

The American Textbook of Prosthetic Dentistry

IN Contributions by Eminent Authorities. Edited by L. PIERCE ANTHONY, D.D.S., Editor of The Journal of the American Dental Association; formerly Editor of the Dental Cosmos. Seventh edition, thoroughly revised. Illustrated with 842 engravings and 3 colored plates. Philadelphia: Lea & Febiger. 1942. Price $11.

This book is the revised edition of a text which has been standard for many years. Beautifully bound and printed, this seventh edition should appeal to the booklover. While it is similar in general appearance to the sixth edition, the new edition has been enlarged by approximately 130 pages. It is profusely illustrated with pictures, charts

and diagrams. Some excellent additions have been made, but criticism might be offered that some of the older illustrations have served their time and detract rather than add to an otherwise good selection.

It takes courage to write a book covering as large and as involved a subject as prosthetic dentistry. The original work of preparation is arduous. There is also the problem of revision and keeping the book up-to-date. Fundamental principles remain the same, year in and year out, but methods and materials are in a constant state of change, and many of these which are acceptable today are modified or even rejected tomorrow. Unlike the sale of the popular novel, the sale of a professional book is limited, and unless the writer takes into consideration the personal satisfaction of achievement, the returns are not commensurate with the time and effort required. A division of the labor involved among men qualified in the prosthetic field is undoubtedly one of the reasons that it has been possible for the American Textbook of Prosthetic Dentistry to keep up-to-date and to hold the popularity that it has enjoyed for the past forty-six years.

The contents of the seventh edition cover every phase of prosthetic dentistry and are the contributions of thirteen authorities in the field. Four new names appear in the list of contributors. Conservatism and high standards as to content have always been the policy of the editors, and in the furtherance of this policy, those whom they have selected to write the various chapters have been men of recognized ability. The new selections are no exceptions. The material is well written and the editing shows the able direction of a man who has had a rich experience in editing dental literature. One misses from the editorial staff the name of one of the former editors, Charles R. Turner.

Throughout, the book stresses the importance of evaluating the biologic and other underlying factors in determining a plan of procedure. Emphasis has been upon the "why" of doing a thing as well as upon the "how."

The rewritten chapter on impressions is a good example. The writer makes a keen analysis of basic factors, presenting in a graphic way the anatomy involved and especially the minute anatomy of the denture bearing region. He lays down the principles of retention and then makes a practical application by describing some rational methods of taking impressions. Thoughtful consideration of the material presented, together with a careful study of the fine series of photomicrographs of the supporting tissues, will convince the reader of the logic of the writer's statement that "there appears to be no specific treatment that will satisfy all variations accompanying individual conditions."

The chapter on positional records and articulators, one of the controversial subjects in prosthetic procedure, has been completely rewritten for this edition. The material, as presented, is crisp, clean cut, logically arranged and easily understood. Instead of being dogmatic about one particular method or one particular articulator, the writer presents several methods of taking jaw relationship records, describes four of the principal types of articulators and the technics for their adjustment and then diplomatically leaves it to the reader to make his choice.

Replete as to material and well illustrated, the chapter pertaining to the selection and arrangement of teeth will be found interesting. Also included is an able analysis of the relative merits of anatomic and mechanical forms of posterior teeth—a controversial subject at the present time. The writer defends the anatomic forms and feels that if the mechanical forms are favored because an "easy" method is being sought, it must be expected that efficiency of mastication as well as appearance must often be sacrificed. He refutes the claim that mechanical forms compensate for poor retention by eliminating cusp interference by reasoning that properly coordinated anatomic forms present no cuspal interference, which, if present, is an indication that the operator does not know how to coordinate cusp surfaces with habitual jaw movements. He grants that there are times when cusp modification is necessary, but maintains that "any one capable of using and adapting cusp forms properly to the requirements of any edentulous case can choose most intelligently when or where to use non-anatomical forms."

In the chapter devoted to the processing of denture base materials, the man interested in vulcanizing will find that some helpful new data relative to time and temperature

have been added. Owing to the widespread interest in acrylic resin, a description of the technic for processing this material is a wise addition to this chapter.

In the search for a denture base material with qualities superior to those of vulcanite, sufficient progress has been attained to warrant the addition of a new chapter evaluating the present situation. The new contributor presents in clear, readable style some of the history, chemistry and properties of the materials which have been tried, and especially of the one giving the most promise at the present time—the acrylic resin.

Diagrams and illustrations have been added to the partial denture section. Without question, nearly all of the fundamental principles of this type of service are presented in the text, but owing to the style in which the material is presented and to the confusion produced by the great number of charts and illustrations, it is hard to follow and to get a clear coordinated concept. On the basis of number and location of remaining teeth, it may be interesting to theorize regarding the number and variety of designs that are possible, but this would have more value if teeth were always average as to shape and inclination. This not being true in a majority of cases, and since the use of the dental surveyor is much more comprehensive than the method presented, it is disappointing that the author did not devote more space to surveying and to the development and application of a few guiding rules.

One wonders at the advisability of including the subject of fixed crowns and bridgework in a book devoted largely to removable appliances. The material as presented is interesting, but covers technics which either are too intricate and involved or are obsolete. The author is dogmatic when he states that "most operators agree that the slice preparation for inlays is, everything considered, the most desirable method."

Chapters such as those pertaining to educating the denture patient, esthetics and hygienic care of artificial dentures are well written and were given but slight revision. The reader, if interested in cleft palate work, may be disappointed in not finding some new ideas.

Each of the preceding six editions of the American Textbook of Prosthetic Dentistry has been popular as a source book of information, and this newly published seventh edition, with its wealth of good material, should be equally valuable.

EARLE S. SMITH.

Basic Principles in Dentistry

By VICTOR H. SEARS, D.D.S. Formerly Professor of Prosthetic Dentistry, New York University. Cloth. Price $3.50. 195 pages with numerous illustrations. New York and Chicago: The Pitman Publishing Corporation, 1942.

THIS is an interesting commentary on the principles of dentistry, with emphasis on prosthetic dentistry. It could perhaps just as well be titled, "Basic Principles in Prosthetic Dentistry."

For a professional book, the form is unusually good, and the book is very readable.

It is not intended that this volume shall serve as a text for undergraduate dental students, but rather that it shall be useful to senior students and graduate dentists. As a general guide to profitable thinking and efficient practice, the book will have a place in the dental library.

There are eight chapters and an adequate index. The lengthiest of these chapters deals with the principles of physics and is entirely understandable and appropriate, considering the author's interest and accomplishments in the field of posterior mechanical tooth forms. This chapter deals with twenty-three main points including such topics as direction of closing force, articular surfaces of the glenoid fossa, field of the denture base support and the magnitude of muscle pull.

In the closing pages of the chapter will be found an excellent treatment of the subject of phonetics.

For the most part, the material covered has been condensed greatly, but references at the end of each chapter offer ample opportunity for a more detailed study.

The book is written in a style that permits easy and rapid reading, and should be useful as additional reading for all who are interested in prosthetic dentistry.

JAMES H. PEARCE.

ASSOCIATION ACTIVITIES

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President's Message

HOW CAN I HELP TO WIN THE WAR?

In these disturbed and troublous times, there are uppermost in the minds of all dentists who are concerned about the welfare of the nation, the profession or their own welfare, several questions of serious moment:

"How can I help to win the war?" "How am I going to be affected by the emergency?" "What should organized dentistry do?" and last, but not least, "What of the position of dentistry in the postwar period?" It is clear that these are all pertinent questions, but the question "How can I help to win the war?" is by far the most important at the moment.

It is quite obvious that the war is not going to be won by slogans, by painting V's on the sidewalk or by poster campaigns. It is going to be won by fighting, as is the usual way to win a war, and fighting means men, airplanes, ships, munitions, transportation, food and medical supplies. It means disruption of the usual trend of affairs and dislocation of millions of persons from their usual routine. It means priorities, shortages, quotas and many other things. But more than any other single thing, it means that we must all keep our minds on the stark and realistic fact that we are at war and that it must be won.

As dentists, we can help in the national emergency in many ways. We can and should cooperate with the Procurement and Assignment Service. This service, which attempts to secure professional personnel for the armed and other government services, represents a sound approach to a difficult problem. This being a total war, every man, woman and child in the United States is involved, and these all must receive protection against dental ill-health, while many of our colleagues are serving the armed forces. Therefore, the Procurement and Assignment Service is attempting to meet the request of government agencies in a way which will not seriously reduce the dental or medical service in any community.

In order that we may know how we stand, every dental practitioner, man or woman, old or young, should fill out and return the new questionnaire that is now being distributed by the Procurement

and Assignment Service. Furthermore, may I suggest that inasmuch as every dental practitioner under 45 years of age comes under the Selective Service System, he should enroll with the Procurement and Assignment Service by indicating on the questionnaire his willingness to serve in certain branches of service if he is called and is physically and professionally qualified. If he is not called, he should do his best in his special field and cooperate in every effort toward victory.

That every dentist will be affected by the emergency is quite obvious. Victory will require that we give rather than take. It will require that dentistry have greater unity of purpose in order that it may assist the government in every possible way to stop the existing revolt against civilization. Here I am glad to say that the dental profession has thus far met every request of the Army and Navy and is cooperating fully with other government agencies. It has been gratifying that when the government has turned to dentistry in this emergency, we have had available the necessary resources. We have the means of continuing this cooperation, and we may need to use it to the fullest extent before victory is achieved. While we are in the war now, it is not likely that we are in so far as we will be in the future.

A facsimile of the questionnaire being sent out by the Procurement and Assignment Committee is published in this issue of THE JOURNAL with instructions for answering the questions, and it is exceedingly important for every dentist to give immediate attention to the questionnaire in order to assist the selective service system in facilitating the work of equitable distribution of the manpower of dentistry.

With the accumulated knowledge at our command, and with serious public dental health and professional problems to be solved, we must take the offensive, to aid not only in winning the war, but also in winning the peace. We must not build any Maginot lines, or bury our heads in the sand. There is too much to be done. There is the task of preserving our freedom and of advancing our American civilization. In addition, there are our responsibilities to society which in terms of dental health are becoming more pressing. I am certain that we can do the job, and do it well, both during the war and during the postwar period.

Owen a. Oliver

COMMITTEE ON DENTAL PREPAREDNESS

LATEST INFORMATION ABOUT ARMY COMMISSIONS

UNDER date of April 16, 1942, the following telegram was received from Lieut.-Col. Sam F. Seeley, executive officer of the Procurement and Assignment Service.

Dr. Gerald D. Timmons
212 East Superior St. Chicago, Ill.

The office of the Surgeon General has announced that vacancies in the Dental Corps are for the present reserved for only those dentists who are in class 1-A or who have been inducted. I am authorized today to announce that one thousand officers may expect early commission and that those in class 1-A should apply immediately to the office of the Surgeon General for application forms stating age, that they are in class 1-A, name, address and school of graduation. All cases will be cleared through procurement and assignment service. Please publicize immediately.

(signed) SAM F. SEELEY, M.D.

It is to be noted that this communication differs from the one sent out under date of March 13, 1942, wherein it was stated that to make application for a commission, an application should be directed to the Procurement and Assignment Service. In this the latest order, the application should be directed to the Office of the Surgeon General, giving the particulars as related in the telegram. The application will, as is stated, be cleared through the Procurement and Assignment Service, but the original contact has been changed to the Office of the Surgeon General.

It should also be noted that only those men in Class 1A should apply. Commissions are reserved for this group of men, together with those men who may have been inducted into the service as privates. This, at the present time, does not include those men who registered under the Selective Service Acts February 16, 1942.

THE ENROLLMENT FORM AND QUESTIONNAIRE FOR PROCUREMENT AND ASSIGNMENT SERVICE

THE enrollment form and questionnaire for the Procurement and Assignment Service are reproduced on the following pages. Undoubtedly, most dentists have by now received these blanks. The reproduction is made in order to permit a study of the blank.

Every dentist, regardless of age, physical condition, sex or connection with a governmental agency, is urged to fill in the blanks and return them to the Procurement and Assignment Service at once.

Two points concerning the Procurement and Assignment Service are of the utmost importance: First, the Procurement and Assignment Service does not, in any way, supersede the Selective Service Acts. Second, the Procurement and Assignment Service has no power to alter the position of any practitioner. It is a service to the profession, formed for the express purpose of conserving the professional manpower of the nation. It is based solely on the voluntary action of the men of the profession, and if this

EXECUTIVE OFFICE OF THE PRESIDENT

DENTAL ENROLLMENT FORM FOR PROCUREMENT AND ASSIGNMENT SERVICE

NATIONAL ROSTER OF SCIENTIFIC AND SPECIALIZED PERSONNEL
Jointly Administered by
NATIONAL RESOURCES PLANNING BOARD AND THE UNITED STATES CIVIL SERVICE COMMISSION

PROCUREMENT AND ASSIGNMENT SERVICE FOR PHYSICIANS, DENTISTS, AND VETERINARIANS, OFFICE OF DEFENSE HEALTH AND WELFARE, OFFICE FOR EMERGENCY MANAGEMENT

ALL INFORMATION SUBMITTED ON THIS FORM WILL BE HELD CONFIDENTIAL

THE EXECUTIVE OFFICER,
PROCUREMENT AND ASSIGNMENT SERVICE FOR PHYSICIANS, DENTISTS, AND VETERINARIANS
Washington, D. C.

I, the undersigned, a duly licensed dentist, hereby enroll with the Procurement and Assignment Service, and submit the following statement of my qualifications and experience. I am indicating my first, second, third, and fourth choices of assignment for which I should like to be considered a candidate if called upon by the Procurement and Assignment Service.

(Enter 1, 2, 3, 4, opposite your preferences)

United States Army Dental Corps	
United States Navy Dental Corps	
United States Public Health Service	
United States Civil Service Agencies (Includes Veterans' Administration, Indian Service, Panama Canal Service, and others. Specify one of these agencies under "Remarks" if you wish.)	
Office of Civilian Defense (Full Time)	
State Health Departments	
Local Health Departments	
Industrial Practice	
Civil Practice in Home Community	
Civil Practice in Other Localities	
State and Local Institutions	

Other Services (Specify) .....

.....

.....

.....

.....

REMARKS: .....

.....

.....

(Signed) .....

Dated ..... (Address) .....

voluntary action fails, the only remaining recourse is "involuntary recruitment" of professional men.

The enrollment blank provides the opportunity for a professional man to indicate his willingness to serve and, at the same time, presents the opportunity to him to indicate his choice, first, second, third and last, of the various types of service.

The questionnaire, in some instances, duplicates the information which was

EXECUTIVE OFFICE OF THE PRESIDENT

DENTAL QUESTIONNAIRE FOR PROCUREMENT AND ASSIGNMENT SERVICE

NATIONAL ROSTER OF SCIENTIFIC AND SPECIALIZED PERSONNEL
Jointly Administered by
UNITED STATES CIVIL SERVICE COMMISSION AND NATIONAL RESOURCES PLANNING BOARD

PROCUREMENT AND ASSIGNMENT SERVICE FOR PHYSICIANS, DENTISTS, AND VETERINARIANS, OFFICE OF DEFENSE HEALTH AND WELFARE, OFFICE FOR EMERGENCY MANAGEMENT

ALL INFORMATION SUBMITTED ON THIS FORM WILL BE HELD CONFIDENTIAL
If more space is needed for any of the questions use inside pages

(PRINT OR TYPE)

1. Name and address:

Name..... (First) (Middle) (Last)

Office address..... (Street and number) (City) (County) (State)

Home address..... (Street and number) (City) (County) (State)

2. Date of birth:

..... Age at last birthday.....
(Month) (Day) (Year)

Place of birth..... (State or foreign country)

3. Citizenship (Check one):

1. ☐ Native born or foreign born of United States parentage.
2. ☐ Naturalized citizen. Year of naturalization.....
3. ☐ First papers obtained.
4. ☐ Final papers applied for, but not yet obtained.
5. ☐ Alien—United States Citizenship not applied for.

If you checked items 2, 3, 4 or 5, specify country of last citizenship.....

4. Present marital status. Dependents:

(Check one):
1. ☐ Single.
2. ☐ Divorced or separated.
3. ☐ Widowed.
4. ☐ Married.

Number of dependents (specify):
☐ Under 18.
☐ Over 18. (Include spouse if dependent)

5. Race and sex:

	Male		Female
1.	☐	White	☐. 6
2.	☐	Negro	☐. 7
3.	☐	Other	☐. 8

If other, specify race.....

6. Foreign language (Check proficiency):

Languages	*Read* Exc.	Good	Fair	*Spoke* Exc.	Good	Fair	*Auditory Comprehension* Exc.	Good	Fair
.....	☐	☐	☐	☐	☐	☐	☐	☐	☐
.....	☐	☐	☐	☐	☐	☐	☐	☐	☐
.....	☐	☐	☐	☐	☐	☐	☐	☐	☐
.....	☐	☐	☐	☐	☐	☐	☐	☐	☐

7. Military service:

(a) Have you ever served on ACTIVE DUTY in the United States armed forces or any United States Reserve Corps?
Period of Service: From..... To.....
Service and Branch.....
Highest rank or grade.....
Date of rank.....

(b) Have you ever served in the armed forces of any country other than the United States? Yes ☐ No ☐
Period of Service: From..... To.....
Name of country.....
Service and Branch.....
Highest rank or grade.....

(c) Are you now or have you ever been a member of any United States Reserve Corps? Yes ☐ No ☐
Period of Service: From..... To.....
Service and Branch.....
Highest rank or grade.....
Date of rank.....

(d) Have you ever applied for a commission in any United States Reserve Corps? Yes ☐ No ☐
If yes, give Service and Branch.....
Were you accepted? Yes ☐ No ☐
Action pending ☐
If not accepted give reasons (if known) and approximate date.....

8. Physical Condition:

Specify any physical defect, disease, or disability. If none, write "None." (Emphasize particularly defects which may in any way limit your working capacity.)

.....

.....

9. ENUMERATE and *describe* your hobbies (aviation, radio, photography, cryptanalysis, etc.).

.....

.....

.....

10. Foreign travel (do not include ordinary tourist travel):

Indicate specifically any significant foreign experience you have had: Country and subdivision.....
Under whose auspices..... Dates.....
Purpose and nature.....

obtained by the Preparedness Questionnaire, but in many particulars it is different. In addition, it will bring to a war time status the information about the profession. Answering the first questionnaire excuses no one from answering the second.

If any dentist has not received a copy of the following forms, he can have one on request from either the Procurement

11. Education and licensure:

(a) Did you have college training before beginning the study of Dentistry? Yes ☐ No ☐ 0

If yes, give name of school .....

Location of school ..... (State)

Degree, if any ..... Year of degree .....

(b) Graduate of ..... (Exact name of Dental School at time of graduation)

State in which school is/was located .....

Name of degree..... Year of graduation .....

(c) Are you a graduate of a Medical School? Yes ☐ No ☐ 00

If yes, give name of school .....

Location of school ..... (State)

Year of graduation .....

(d) Do you hold any other Graduate or Post-Graduate degrees by an approved university? Yes ☐ No ☐ 00

If so, give the degree ..... Date of degree.....

Name of University .....

(e) First year of licensure .....

State in which first licensed .....

In what states are you licensed to practice? .....

.....

12. Appointments:

(a) Do you hold any of the following appointments? Yes ☐ No ☐ 00000

		Full time			Part Time	
State Health Department	01			21		
Local (Municipal, County) Health Department	02			22		
Federal Health or Medical Service:						
Public Health Service	04			24		
Veterans' Administration	05			25		
Children's Bureau	06			26		
Indian Service	07			27		
Dep't of Justice, Prisons-Hospitals-Farms	08			28		
Other Federal Service, specify ..	09			29		
Selective Service System (Advisory Board)	10			30		
Selective Service System (Examining Board)	11			31		
Civilian Defense	12			32		
Teaching in Dental Schools	03			23		
Teaching in Medical Schools	13			33		
Research	14			34		
Industrial Health or Medical Service	15			35		
Executive:						
Insurance Company	16			36		
Hospital	17			37		
Other, specify	18			38		
Hospital Staff	19			39		
Other, specify	20			40		

12. Appointments—Continued.

(b) Give names of hospitals or institutions with which you are connected in above appointments .....

(c) State the exact nature of your position .....

.....

13. Type of work (check one):

General Practice	1	
Special Practice	2	
Research (full time)	3	
Teaching (full time)	4	
Research (part time)	5	
Teaching (part time)	6	
Other, specify	9	

14. Specialization:

If a specialist place a cross (X) opposite the specialty to which you devote all of your time or a check (✓) to indicate the branch of Dentistry to which you give special attention:

Oral Surgery	1	
Orthodontia	2	
Pedodontia	3	
Periodontia	4	
Prosthodontia	5	
Radiodontia	6	

15. Method of practice:

Individual	1	
Partnership	2	
Group	3	
Interne	4	
Resident	5	
Retired	7	
Not in practice	8	
Other	9	

16. This question duplicates the information on the ENROLLMENT FORM, page 1; it is essential to facilitate the work of the punch-card system. Please indicate your preference (1, 2, 3, 4) as expressed on the ENROLLMENT FORM:

United States Army Dental Corps	01	
United States Navy Dental Corps	02	
United States Public Health Service	03	
U. S. Civil Service Agencies (If you specified a particular agency on page 1, write its name here: .....)	04	
State Health Department	05	
Local Health Department	06	
Industrial Practice	07	
Civil Practice in Home Community	08	
Civil Practice in other localities	09	
State and Local Institutions	10	
Other services, specify	19	

and Assignment Service, 601 Pennsylvania Avenue, N.W., Washington, D. C., or the American Dental Association, 212 East Superior St., Chicago, Ill.

Please do not postpone action on this matter. It is important that dentistry perform its duty in the total war effort and this is a part of that duty.

SALVAGE OF WASTE MATERIALS

FOLLOWING is a letter which was forwarded to the American Dental Association by James A. Crabtree, executive secretary of the Health and Medical Committee of the Office of Defense Health and Welfare Services.

It is the beginning of a national organized effort to salvage the waste materials which appear in the offices of professional men. In the past, local campaigns have been organized in an effort to salvage these materials, but here for the first time is presented an organization through which this effort can be continued and expanded.

Following the letter, there appear the names and addresses of the chairman and executive secretaries of the state salvage committees. Through contact with these men, state and local dental societies can complete plans for systematic salvage of the many vital materials so frequently discarded in a dental office.

WAR PRODUCTION BOARD
Washington, D. C.
March 30, 1942

Dr. James A. Crabtree
Executive Secretary
Health and Medical Committee
Office of Defense Health & Welfare Services
Washington, D. C.

Dear Doctor Crabtree:

As you are well aware, there is a critical shortage of many necessary materials at the present time in this country. The primary sources of supply are now denied to us owing to conditions both in the Pacific area and in Europe. Therefore, it is becoming increasingly necessary to tap all possible secondary sources and to reclaim every ounce of these badly needed materials that we can lay our hands on.

To this end, we have established, through the General Salvage Section of this bureau, state salvage committees in practically every state in the country. These state committees have in turn established local salvage committees in every local defense council in their territory. Complete organization, nationwide, can be expected by May 1.

We believe that there is a potentially large source of these critical materials to be reclaimed from hospitals, clinics, health departments, diagnostic laboratories; in fact, from all health and medical institutions of any kind, not excluding offices of physicians and dentists. The Bureau of Industrial Conservation therefore requests that the Health and Medical Committee of the Office of Defense Health and Welfare Services make every effort to see that the need for these scarce materials is brought to the attention of all such institutions and individuals as we have outlined above.

First and foremost on our list of scarce materials must be rubber, which is now America's number one shortage. Our war machine must roll on rubber, and since the rupture of trade lines to the Far East, we must rely in large measure upon existing scrap rubber now in this country. There is also an acute shortage of metals, ferrous and non-ferrous. We do not anticipate that medical institutions can make available to us much tonnage in the scrap iron and steel line, but we are reliably informed that large quantities of some of the scarcer and less usual metals may be collected from such sources. All metals are vitally needed.

It is suggested that all medical institutions and individuals desirous of helping in our "Salvage for Victory" program get in touch directly with their state or local salvage committee, which will be able to indicate to them the best method of procedure in the collection and disposition of these materials. We are enclosing herewith the current list of these state salvage committees, and new ones will be sent to you as they are issued. We will also bulletin all our state offices, whenever you so advise us, instructing them to have their local committees get in touch with all doctors, dentists and medical institutions of any kind in their territory.

STATE SALVAGE COMMITTEES COMPLETE WITH BOTH CHAIRMAN AND EXECUTIVE SECRETARY

State	Chairman	Executive Secretary	Office
Alabama	Thomas Bragg	J. Leon Gilbert	Klein-Ashley Bldg., 102 Church St., Montgomery Ala.
Arkansas	Elmer Gosden	Wallace Cowan	426 Donaghey Bldg., Little Rock, Ark.
California	E. P. Murphy	Harold Brayton	State Capitol, Sacramento, Calif.
Connecticut	Seth L. Pierrepont	Bice Clemow	410 Asylum St., Hartford, Conn.
Delaware	J. Stuart Groves	R. G. Rust	DuPont Hotel, Wilmington, Del.
District of Columbia	James E. Colliflower	Horace Walker	412 Albee Bldg., 15th & G Sts., N. W., Washington, D. C.
Florida	George L. Burr, Jr.	C. C. Codrington	313 City Administration Bldg., Tallahassee, Fla.
Georgia	William T. Anderson	Thomas H. Hall, III	617 Bibb Bldg., Macon, Ga.
Idaho	John O. Orr	Lindon F. Watson	State Capitol, Boise, Idaho
Illinois	Nathaniel Leverone	Ben Regan	3015 Civic Opera Bldg., 20 North Wacker Dr., Chicago, Ill.
Indiana	Clarence A. Jackson	Dudley A. Smith	Board of Trade Bldg., Meridian & Ohio Sts., Indianapolis, Ind.
Iowa	Herbert Plagman	Fred J. Derrick	712 Crocker Bldg., Des Moines, Iowa
Kansas	Byron Gourley	Harry W. Woods	(Temp.) Ottawa, Kan.
Kentucky	E. C. O'Rear	G. Lee McClain	Old State Capitol Bldg., Frankfort, Ky.
Louisiana	Parrish Fuller	R. R. Saunders	Guaranty Bank Bldg., Alexandria, La.
Maine	Richard N. Hallett	Clifford A. Somerville	Rm. 510, 142 High St., Portland, Maine
Maryland	H. Findlay French	James F. Solley, Jr.	1510 Baltimore Trust Bldg., Baltimore, Md.
Massachusetts	Gurth F. Chambers	John I. Taylor	18 Tremont St., Boston, Mass.
Michigan	Kenneth M. Burns	John D. McGillis	1205 Detroit Savings Bldg., Detroit, Mich.
Minnesota	Raymond J. Greengard	Linus E. Vorpahl	310 Globe Bldg., St. Paul, Minn.
Mississippi	Leland Speed	L. Russell Ellzey	Deposit Guaranty Bank Bldg., Jackson, Miss.
Missouri	Sidney R. Baer	H. A. Trowbridge	State Office Bldg., Jefferson City, Mo.
Nebraska	J. W. Seacrest	Mark Caster	1305 State Capitol, Lincoln, Nebr.
Nevada	Albert Caton	Bernard Hartung	State Capitol, Carson City, Nev.
New Hampshire	E. J. Soucy	E. J. Soucy	State House, Concord, N. H.
New Jersey	Robert T. Bowman	Clinton M. White	114th Regiment Armory, Trenton, N. J.

New Mexico	David Hughes	Fay Guthrie	202 Water St., Santa Fe, N. Mex.
New York	R. Murray Willard	William Arnoldy	112 State St., Albany, N. Y.
North Carolina	N. E. Edgerton	James B. Vogler	227 E. Edenton St., Raleigh, N. C.
Ohio	L. E. Pierson	Robert O. Weible	101 N. High St., Columbus, Ohio
Oklahoma	E. H. Moore	Levi Ackley	438 Kennedy Bldg., Tulsa, Okla.
Oregon	Claude I. Sersanous	Ralph H. Mitchell	314 Pioneer Trust Bldg., Salem, Ore.
Pennsylvania	John S. Rice	Colley S. Baker	302 Main Capitol Bldg., Harrisburg, Pa.
Rhode Island	Frederick A. Young	Lawrence Lanpher	Hospital Trust Bldg., 15 Westminster St., Providence, R. I.
South Carolina	Rex Enright	Tonquin E. Lagrons	1230 Sumter St., Columbia, S. C.
Tennessee	Leonard Sisk	Everett R. Jones	State Capitol, Nashville, Tenn.
Utah	Marion J. Greenwood	Boyden L. Wood	State Capitol, Salt Lake City, Utah
Virginia	Fred W. Scott	C. H. Luebbert	10 South Fifth St., Richmond, Va.
Vermont	A. Vail Allen	John O. Baxendale	49 State House, Montpelier, Vt.
Washington	J. C. Haley	Elmer J. Nelson	Old Capitol Bldg., Olympia, Wash.
West Virginia	H. E. Clovis	Burman T. Mitchell	56 Capitol City Bldg., Charleston, W. Va.
Wisconsin	Robert E. Pabst	William E. Simons	7058 Plankinton Bldg., 161 W. Wisconsin Ave., Milwaukee, Wis.
Wyoming	R. L. Esmay	Edward S. Moore, Jr.	State Capitol Bldg., Cheyenne, Wyo.

It can be expected that the Health and Medical Committee, which has already contributed so largely to the welfare of the nation, may by this plan be enabled to broaden the scope of its useful activities and provide a very definite added service to the country in this time of need.

Very truly yours,
Paul C. Cabot, *Deputy Chief*,
Bureau of Industrial Conservation.

BUREAU OF PUBLIC RELATIONS

DENTAL HYGIENE INSTITUTE OF CHICAGO

ALWAYS active in public relations work, the Chicago Dental Society has entered upon an intensive program of dental health education in the Chicago area. An organization known as the Dental Hygiene Institute of Chicago has been set up to carry out the program.

The institute will operate in 1942 on a budget of $12,000, one-half of which has been provided by the Chicago Dental Society. Additional support has been forthcoming from the commercial houses allied to dentistry, from individual members of the dental profession in the Chicago area and from civic organizations whose health programs are concerned with dentistry. Mr. William B. Pringle has been engaged as full-time educational director, with offices at 30 North Michigan Ave., Chicago.

The groundwork for the institute has long been laid. For a number of years, dental health education has engaged the interest of a number of women's organizations in Chicago, whose representatives made up a group known as the Chicago Mouth Hygiene Council. These individuals will continue as officers of the new organization, but new by-laws provide that all institute activities and programs shall first be approved by a committee from the Chicago Dental Society. The professional Guidance and Policy Committee is composed of H. R. H. Brevig, chairman of the Chicago Dental Society Public Relations Commission; Lon W. Morrey, G. M. Hambleton, Charles J. Coffey, Joseph B. Zielinski and Mr. John J. Hollister, executive secretary of the Chicago Dental Society.

The decision to employ a lay educational director was based on the belief that the job was not of a technical nature, but required a background of organization and promotion such as few dentists have had. Furthermore, it was believed that a lay interpretation of dental care, subject to the approval of members of the dental profession, should be most effective.

The institute has planned three major activities for 1942, including (1) revival of Chicago's well-known industrial diagnostic service; (2) the production and program-booking of sound slide films and motion pictures on dental care, and (3) general promotion and publicity.

Inaugurated by the Chicago Dental Society in 1934, the industrial diagnostic service provides for the dental examination of employed persons in their places of employment, and subsequent referal to the family dentist for treatment. Under institute direction, costs of the examination will be borne by the plant management, on the basis that dental care will improve the health and efficiency of employes. Supervision, direction and certain items of equipment, however, will be provided by the institute without charge. The examination of employes of one plant has already been concluded, and negotiations are under way with several other firms in the Chicago area.

Of equal importance in the institute program is the production of sound slide films on dental care and the booking of these films (or motion pictures secured from other sources) on the programs of the various civic organizations. As a lay organization, with support from other civic groups, the institute has already presented dental programs before a number of women's groups. It is expected that lay representation in the institute will make it possible to secure program time for dental subjects before a large

number of civic and service organizations, parent-teacher groups, women's clubs, Rotary, Lions and others.

Sound slide films are a highly adaptable medium for visual education. They consist of still pictures held momentarily on a screen to the accompaniment of a record-player built into the projector. The institute has one such film in production, and others are planned, notably one to use before employe groups in introducing the industrial diagnostic service.

Under the heading of general promotion and publicity, the institute proposes to supply employe publications, house organs and community newspapers in the Chicago area with dental educational releases. Metropolitan papers, radio and other media will be used as opportunity affords, although no advertising space will be purchased. The institute will also cooperate closely with the health programs of other civic groups, such as the Summer Round-Up, and school health committees of the parent-teacher organizations, the board of education, the board of health, etc.

Before being put into effect, all projects of the institute will be approved by the Professional Guidance and Policy Committee of the Chicago Dental Society, and it may, therefore, be assumed that all activities will be directed in the best interests of both the public and the dental profession.

W. K. KELLOGG FOUNDATION THE FIRST ELEVEN YEARS

FOR years, persons interested in public health activities in the United States or Canada have followed with interest the progress of Michigan's W. K. Kellogg Foundation. Now, for the first time, reports of the foundation's achievements during its first eleven years are available in printed form.

As might well be expected, the format of this 216 page report, entitled "W. K. Kellogg Foundation—The First Eleven years," and just off the press, is worthy of the foundation. In a sense, it is a testimonial to the foundation's original president and general director, Dr. Stuart Pritchard, who died August 4, 1940, since the conception of the Foundation's plan and administration on a cooperative, problem-solving basis was largely his.

The story of the first eleven years, the philosophy of the foundation and the methods and manner in which this philosophy was transferred into action, comprises the most interesting pages of the report.

The charter of the foundation sets forth its purpose as "the promotion of the health, education and welfare of mankind, but principally of children and youth, directly or indirectly." The problem which faced the trustees in the selection of a plan whereby this purpose could be put into action can well be imagined. The unfolding of the plan itself is intensely interesting to every one interested in public health work. The various activities of the plan in the seven counties in which it is operating are graphically depicted by some 214 action shots.

Health workers are indebted to George B. Dorling, president; Emory W. Morris, General director, and the other members of the Kellogg staff for making this report available. The philosophy of the foundation is fairly well summarized in the following statement:

> While food, raiment and shelter are necessities, and while it is essential that the educational facilities be maintained on high levels, it is only through cooperative planning, intelligent study and group action—activities on the part of the entire community—that lasting results can be achieved.

A WAR POLICY FOR AMERICAN SCHOOLS

PROMOTION of health and physical efficiency is one of the priorities in wartime education, according to "A War Policy for American Schools," just issued by the Educational Policies Commission of the National Education Association.

Health and physical efficiency must be promoted. Everything possible should be done to maintain standards of health and safety education and to make these standards universal and compulsory. Thorough physical examinations, with systematic and vigorous follow-up to secure the correction of remediable defects, should be given to all children on entering school and at intervals of two or three years thereafter. The education of parents in order to extend their knowledge of the means of promoting the health and well-being of their children should be pressed vigorously. The preschool health roundup, for many years sponsored successfully by schools and parent-teacher organizations, might well be paralleled by a final health check-up for all youth on leaving school.

The physical deficiencies of youth, particularly those involving dental defects, poor vision and malnutrition (all common causes of rejection for military service) should be noted by teachers, school nurses and physicians and, wherever possible, remedied by effective follow-up, medical advice and treatment. In areas where no public health services are available to treat health deficiencies of persons financially unable to employ private physicians, the schools should either seek funds to enable them to render these services or, preferably, give leadership in the community to establish such services under health authorities.

EIGHTY-EIGHT PER CENT IMPROVEMENT AFTER FIVE YEARS EXECUTION OF DENTAL PROGRAM —THE USE OF EXPECTED AND DISTRIBUTION TABLES FOR EVALUATION PURPOSES

By LEON R. KRAMER,* D.D.S., M.P.H., Topeka, Kans.

THE city schools of Goodland, Kan., are now completing the fifth year of their dental program, which was instituted in the school year 1936-1937 by the Dental Division of the Kansas State Board of Health. The population of Goodland is approximately 3,100 and it is a representative rural town of this state.

The program consists of annual dental inspection by local dentists, classroom instruction and follow-up through correlated activities of teachers and the public health nurse, and the providing of dental care for indigent children by welfare or other local agencies. In Goodland, the Red Cross assisted in the care of underprivileged children.

The objective of the program is "To graduate children from school with a healthy mouth, a complete set of teeth in good repair and with the knowledge and desire to maintain this condition."

A count was made of the number of lost permanent teeth in all students in grades 7-8 (sixty-seven in the seventh,

*Director, Division of Dental Hygiene, Kansas State Board of Health.

Read before the Kansas State Dental Association, Wichita, April 28, 1942.

TABLE 1.—EXPECTED TABLE OF ORAL PATHOSIS BASED ON 1,200 CASE RECORDS OF A REPRESENTATIVE GROUP OF KANSAS SCHOOL CHILDREN (GRADES 1-12; 100 IN EACH GROUP)*

1	2	3		4		5	6	7	8		9		10		11		12	13	14	15
Grade	No. of Children	Diseased Teeth		Filled Teeth		Missing Teeth P	Total DMF	No. per Child DMF	Temporary Teeth Attacked		Permanent Teeth Attacked		Unfilled Teeth		Filled Teeth		Diseased Gums and Abscessed Teeth	Malocclusion	Without Defects	DMF Rate per Child P
													No. per Child		No. per Child					
		T†	P	T	P					No. per Child		No. per Child	T	P	T	P				
1	100	304	26	49	4	0	383	3.8	353	3.5	30	0.3	3.0	0.26	0.49	0.04	13	6	23	0.3
2	100	335	64	41	6	0	446	4.5	376	3.8	70	0.7	3.35	0.64	0.41	0.06	15	22	10	0.7
3	100	288	83	59	21	3	454	4.5	347	3.5	104	1.04	2.9	0.83	0.59	0.21	20	16	9	1.08
4	100	187	130	50	52	14	433	4.3	237	2.4	182	1.8	1.9	1.3	0.5	0.52	14	17	12	1.96
5	100	123	167	44	45	17	396	4.0	167	1.7	212	2.1	1.2	1.7	0.44	0.45	14	12	16	2.29
6	100	55	180	15	82	11	344	3.4	70	0.7	262	2.6	0.55	1.8	0.15	0.82	9	21	13	2.74
7	100	14	241	7	94	27	383	3.8	21	0.2	335	3.4	0.14	2.4	0.07	0.94	10	16	16	3.62
8	100	6	225	1	88	39	359	3.6	7	0.07	313	3.1	0.06	2.3	0.01	0.88	22	22	14	3.52
Total	800	1,312	1,116	266	392	111	3,198	3.97	1,578	1.97	1,508	1.88	1.6	1.4	0.33	0.49	117	132	113	2.03
9	100		236		194	64	494	4.9			430	4.3		2.36		1.94	18	28	22	4.9
10	100		282		187	46	515	5.1			469	4.7		2.82		1.87	10	20	10	5.1
11	100		251		284	54	589	5.9			535	5.35		2.51		2.84	10	28	14	5.9
12	100		241		316	49	606	6.1			557	5.6		2.41		3.16	12	34	8	6.1
Total	400		1,010		981	213	2,204	5.51			1,991	4.98		2.52		2.45	50	110	54	5.51

*June 2, 1941.
†T, temporary; P, permanent.

†T, temporary; P, permanent.

TABLE 2.—DISTRIBUTION OF CHILDREN HAVING 0 TO 24 TEETH ATTACKED BY DENTAL CARIES (GRADES 1–12; 100 IN EACH AGE GROUP)*

Diseased Teeth per Child	Number of Children Temporary Teeth								Per Cent of 800 Having 0-15+ Diseased Teeth	Diseased Teeth per Child	Number of Children Permanent Teeth								Per Cent of 800 Having 0-15+ Diseased Teeth	Diseased Teeth per Child	Permanent				Per Cent of 400 Having 0-15+ Diseased Teeth
	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8			Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8			Grade 9	Grade 10	Grade 11	Grade 12	
0	30	10	14	26	45	65	90	94	46.7	0	82	64	51	26	23	20	13	11	36.2	0	12	10	6	10	9.5
1	8	8	14	22	15	15	4	5	11.3	1	8	17	20	17	17	17	14	20	16.2	1	9	9	7	7	8.0
2	8	14	15	13	13	12	2	1	9.7	2	8	8	13	24	21	13	14	14	14.4	2	17	8	8	8	10.2
3	10	22	15	10	7	3	2		8.6	3	2	7	9	13	19	18	18	16	12.7	3	12	12	12	10	11.5
4	7	19	14	10	8	4	2		8.0	4		4	7	17	13	14	17	16	11.0	4	7	13	11	10	10.2
5	7	4	5	8	5				3.6	5				3	4	9	6	9	3.9	5	7	9	13	15	11.0
6	10	8	9	6	2				4.4	6					1	5	7	4	2.1	6	14	10	14	7	11.2
7	8	5	6	1	4	1			3.1	7						2	3	4	1.1	7	4	10	9	1	6.0
8	5	3	3	2	1				1.7	8					1		4	2	0.9	8	7	3	5	7	5.5
9	2	2	2	1					0.9	9						1	1	1	0.4	9	5	10	3	4	5.5
10	2	2							0.5	10					1			2	0.4	10		1	2	8	2.7
11	2	2	1						0.6	11						1		1	0.25	11	2	3	2	5	3.0
12			2						0.25	12							2		0.25	12	2	2	4	2	2.5
13	1								0.12	13							1		0.12	13			1	5	1.5
14				1					0.12	14										14	1				0.25
More than		1							0.12	More than										More than	1†		3†	1†	1.2†

*Average per child: Grades 1-8, temporary, 1.97; permanent, 203. Grades 9-12, permanent, 5.5.
†Of children with fifteen or more diseased teeth, two had fifteen; one had sixteen; one had nineteen, and one had twenty-four. (June 2, 1941).

sixty-eight in the eighth, 135 in all). The count was made by the dental director in the presence of the public health nurse and the principal of the city schools.

The length of residence in Goodland was determined in the case of all children who had lost permanent teeth. The figures obtained were then compared with the number of lost permanent teeth found in the same number of children, grades 7-8, who had not received the benefits of a dental program.

The findings were as follows:

Of the 135 children, four who lost permanent teeth were not permanent residents.

Number of lost permanent teeth in 131 children (not in program), 43.

Number of lost permanent teeth in 131 children (in program, permanent residence), 5.

Number of lost permanent teeth in four children (in program, resident four months to three years), 8.

Improvement in loss of permanent teeth in children who were permanent residents, 88 per cent.

Only two students had teeth needing extraction. One boy, a permanent resident, had one hypoplastic tooth needing extraction, and one boy, resident for six months, had one tooth needing extraction. Another boy, resident for five months, had two congenitally missing teeth.

We discovered, in this attempt to make a reasonably true evaluation of the dental program, that it was necessary to measure the results in children who had attended the Goodland schools throughout the entire five-year period.

Using the plan devised by the Dental Division of the Kansas State Board of Health, Mr. Reed, principal of the Goodland schools, with the cooperation of the teachers, the parents, the publice health nurse, the local dentists and local groups and agencies, has demonstrated the effectiveness of intelligent co-ordination of community resources in combating the ravages of dental diseases.

METHOD OF EVALUATION

Table 1 indicates that in the 200 children, grades 7-8 (100 in each grade), sixty-six permanent teeth were lost. One hundred and thirty-one, the number of children in grades 7-8 in Goodland, is 65 per cent of 200. Sixty-five per cent of the sixty-six lost permanent teeth, shown in the table, is 42.9, or the number of lost permanent teeth we would expect to find in the Goodland school children. The difference between the five actually found in the Goodland group and the 42.9 expected gives a fair indication of the improvement, and also the approximate number of corrections over the five-year period, as indicated in the number of teeth attacked shown in the "expected" and "distribution" tables.

The expected table was constructed from a mechanical count of data relative to oral pathosis recorded or cards showing the results of a detailed examination of 1,200 children, grades 1-12, 100 in each grade. The children represent a cross-section of school children in Kansas in which the dental program had not been in effect. Clinton Stalker, formerly with the U. S. Public Health Service and past president of the Topeka Dental Society, made the examinations for the Dental Division of the Kansas State Board of Health.

For the purpose of better understanding the distribution of children having none to fifteen or more teeth attacked by dental caries, a distribution table (Table 2) was made, using the same data as in the "expected table." The distribution table visualizes in an excellent manner the progressive destruction of teeth by dental caries and aids in predicting the number of clinical visits required for dental corrections in any given number of children in the various age groups.

These tables enable us to draw fairly accurate conclusions relative to the amount of corrective service rendered, as

compared with various indexes of evaluation that one may desire to use (100 per cent corrections, unfilled teeth, lost permanent teeth, etc.).

These tables are proving to be valuable for analyzing problems common to the work of a director of a dental program. The attack rate varies in the several states, and the tables afford a fairly accurate picture of the rate, tooth loss and other types of oral pathosis found in the area in which our program functions.

COUNCIL ON DENTAL THERAPEUTICS

FEDERAL TRADE COMMISSION STIPULATION

STIPULATION 02949 ON SQUIBB DENTAL CREAM AND SQUIBB DENTAL POWDER

E. R. SQUIBB & SONS, distributor of dentifrices, and Geyer, Cornell & Newell, Inc., an agency which prepares and disseminates advertisements for Squibb products, entered into a stipulation with the Federal Trade Commission to discontinue certain representations in connection with the sale of "Squibb Dental Cream" and "Squibb Tooth Powder." The respondent corporations, both with offices at 745 Fifth Ave., New York, agree to cease representing that use alone of the dentifrices named contributes to a material degree to the prevention of tooth decay or that the milk of magnesia in such dentifrices is concentrated. (Issued February 22, 1942.)

STIPULATION 02955 ON "PRISCILLA PARKER BREATH CORRECTING LIPSTICK"

FROM R. W. Appleton, trading as Parker-Bouldin Co., 500 Robert St., St. Paul, Minn., the Federal Trade Commission accepted a stipulation to cease representing that a cosmetic designated "Priscilla Parker Breath Correcting Lipstick" is effective in neutralizing offensive breath or that the product's ingredients are harmless. The respondent also agrees not to publish advertisements which fail to reveal that continued use of the lipstick over too prolonged periods of time may in certain individuals cause exfoliation of the skin. It is provided, however, that such advertisement need contain only the statement: "Caution, use only as directed," if the directions in the labeling contain an appropriate warning. According to the stipulation, the respondent's lipstick contains the chemical resorcinol. The respondent also stipulates that he will cease employing the terms "Breath Correcting" or "Deodorizing" in the brand name of the lipstick. (Issued March 19, 1942.)

STIPULATION 3419 ON RITZ BREATH PURIFIER

HONOROFF LABORATORIES, INC., 2448 South Prairie Ave., Chicago, and its president, Fred A. Honoroff, who also trade as Ritz Laboratories, further stipulate that, in the sale of the preparation known as "Ritz Breath Purifier," they will stop representing that the product prevents bad breath or destroys breath odors; will discontinue advertising any specified sum of money as possible earnings of salesmen or distributors of the preparation for any given period of time which is not a true representation of the average net earnings consistently made by such salesmen or distributors under normal business conditions, and will cease representing, through the use of the name "New York" on their stationery or printed matter, that they maintain an office or establishment in New York, when such is not a fact. (Issued March 13, 1942.)

ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following articles in the list of Accepted Dental Remedies.

DENTIFRICES*

Grand Union Tooth Powder: Composition: See Stevens-Wiley Tooth Powder (J.A.D.A., 28:2056, December 1941).

Manufactured by the Stevens-Wiley Mfg. Co., Inc., Philadelphia, Pa. Distributed by Grand Union Tea Co., Chicago, Ill.

Marcelle Tooth Paste: Composition: See Comfort Brand Tooth Paste (A.D.R. Ed. 7, p. 106).

Manufactured by the Comfort Mfg. Co., Chicago, Ill. Distributed by Marcelle Cosmetics, Chicago, Ill.

Morgan's Tooth Powder: Composition: See Graver's Tooth Powder (A.D.R. Ed. 7, p. 108).

Manufactured by Grasco, Inc., Cleveland, Ohio. Distributed by Morgan-Sabalol Products, Inc., New York, N. Y.

ANESTHETICS—LOCAL†

Procaine HCl 2%, Epinephrine 1:50,000: Each cubic centimeter is stated to contain procaine hydrochloride, U.S.P., 0.02 gm.; epinephrine, 0.00002 gm.; sodium bisulfite, 0.001 gm.; potassium sulfate, 0.009 gm., and distilled water. Marketed in injection cartridges (hypotubes), approximately 2.25 cc.

Manufactured by William H. Rorer, Inc., Philadelphia, Pa.

Admission of an article to the list of Accepted Dental Remedies does not imply a recommendation. Information regarding the rules and work of the Council will be sent on request.

HAROLD L. HANSEN, *Secretary.*

*A.D.R. Ed. 7, p. 102.
†A.D.R. Ed. 7, p. 38.

COUNCIL ON DENTAL EDUCATION

ACCELERATED SCHEDULES IN DENTAL SCHOOLS IN THE UNITED STATES

The following table, compiled as of April 2, 1942, shows that thirty-five of the thirty-nine dental schools in the United States have definitely determined upon the establishment of accelerated schedules during the emergency. Mainly, these schools will keep the classes now enrolled in continuous session, except for brief periods between terms, until graduation. About two-thirds of the schools will receive the first new class under the accelerated program in June or July 1942 and about one-third in September or October 1942. In all cases, provision will be made for the completion of the regular course ordinarily covering four academic years in three calendar years. The schools are united in their purpose to maintain the standards already established for admission and graduation.

School	Present Classes Graduate				First New Class		Second New Class	
	Seniors	Juniors	Sophomores	Freshmen	Enters	Graduates	Enters	Graduates
CALIFORNIA								
College of P & S [1]	5-'42	4-'43	1-'44	10-'44	7-'42	7-'45	7-'43	7-'46
U. of California	5-'42	2-'43	10-'43	6-'44	6-'42	2-'45	2-'43	10-'45
U. of So. California	6-'42	3-'43	11-'43	7-'44	9-'42	6-'45	3-'43	12-'45
DIST. OF COLUMBIA								
Georgetown U. [2]	5-'42	3-'43	1-'44	9-'44	6-'42	6-'45	3-'43	3-'46
Howard U.	6-'42	—	—	—	—	—	—	—
GEORGIA								
Atlanta-Southern	6-'42	2-'43	10-'43	6-14-'44	6-'42	2-'45	2-'43	10-'45
ILLINOIS								
Loyola, Chicago	6-'42	6-'43	6-'44	12-'44	6-'42	9-'45	10-'42	12-'45
Northwestern U.	6:9-'42	3:6:9-'43	12-'43	6:9-'44	6:9-'42	6:9-'45	6-'43	6-'46
U. of Illinois	6-'42	6-'43	3-'44	12-'44	12-'42	9-'45	6-'43	6-'46
INDIANA								
Indiana U.	5-'42	1-'43	9-'43	5-'44	5-'42	1-'45	1-'43	9-'45
IOWA								
State U. of Iowa	5-'42	12-'42	8-'43	4-'44	9-'42	4-'45	9-'43	4-'46
KENTUCKY								
U. of Louisville	5-'42	2-'43	11-'43	8-'44	7-'42	5-'45	4-'43	2-'46
LOUISIANA								
Loyola, New Orleans	5-'42	2-'43	10-'43	5-'44	5-'42	2-'45	2-'43	10-'45
MARYLAND								
U. of Maryland	6-'42	2-'43	10-'43	6-'44	6-'42	2-'45	2-'43	10-'45
MASSACHUSETTS								
Harvard U. [3]	6-'42	—	—	—	—	—	—	—
Tufts College	6-'42	2-'43	11-'43	8-'44	7-'42	5-'45	4-'43	2-'46
MICHIGAN								
U. of Detroit	6-'42	2-'43	9-'43	6-'44	9-'42	6-'45	9-'43	6-'46
U. of Michigan	5-'42	2 or 5-'43	2 or 5-'44	5-'44	10-'42	5-'45	10-'43	5-'46

School	Present Classes Graduate				First New Class		Second New Class	
	Seniors	Juniors	Sophomores	Freshmen	Enters	Graduates	Enters	Graduates
MINNESOTA	6-'42	—	—	—	9-'42	—	—	—
U. of Minnesota 4								
MISSOURI	5-'42	5-'43	9-'43	6-'44	9-'42	6-'45	9-'42	6-'46
U. of Kansas City	6-'42	2-'43	10-'43	1-'44	6-'42	2-'45	2-'43	10-'45
St. Louis U.	6-'42	3-'43	12-'43	8-'44	10-'42	8-'45	—	—
Washington U.								
NEBRASKA	6-'42	3-'43	11-'43	7-'44	7-'42	3-'45	3-'43	1-'46
Creighton U.	5-'42	—	—	—	—	—	—	—
U. of Nebraska 5								
NEW YORK	6-'42	3-'43	12-'43	9-'44	7-'42	6-'45	3-'43	3-'46
Columbia U.	6-'42	3-'43	12-'43	9-'44	7-'42	6-'45	3-'43	3-'46
New York U.	6-'42	6-'43	—	6-'44	7-'42	6-'45	7-'43	6-'46
U. of Buffalo								
OHIO								
Ohio State U.	6-'42	3-'43	12-'43	9-'44	6-'42	6-'45	3-'43	3-'46
Western Reserve U.	6-'42	2-'43	10-'43	7-'44	6-'42	4-'45	3-'43	1-'46
OREGON								
North Pacific	6-'42	2-'43	9-'43	6-'45	9-'42	9-'45	9-'43	9-'46
PENNSYLVANIA								
Temple U.	6-'42	2-'43	10-'43	6-'44	6-'42	2-'45	2-'43	10-'45
U. of Pennsylvania	6-'42	4-'43	12-'43	10-'44	7-'42	5-'45	4-'43	4-'46
U. of Pittsburgh	6-'42	2-'43	10-'43	6-'44	7-'42	2-'45	2-'43	10-'45
TENNESSEE								
Meharry 6	5-'42	—	—	—	—	—	—	—
U. of Tennessee 7	6-'42	—	—	—	—	—	—	—
TEXAS								
Baylor U. 8	6-'42	—	—	—	—	—	—	—
Texas Dental	6-'42	3-'43	12-'43	9-'44	9-'42	9-'45	7-'43	6-'46
VIRGINIA								
Med. Coll. of Va.	6-'42	3-'43	12-'43	9-'44	7-'42	7-'45	4-'43	4-'46
WISCONSIN								
Marquette U.	5-'42	2-'43	10-'43	6-'44	9-'42	6-'45	—	—

NOTES

1. Dates tentative.
2. No present plans for acceleration.
3. Courses will be accelerated in Harvard School of Dental Medicine, but not in Harvard Dental School.
4. Acceleration planned, but dates not all determined.
5. No present plans for acceleration.
6. No present plans for acceleration.
7. Acceleration planned, but dates not all determined.
8. No present plans for acceleration.

COMMITTEE ON LEGISLATION

RECENT DECISIONS

DENTAL PRACTICE ACTS—CONSTITUTIONALITY—PROHIBITION OF "CHAIN DENTAL OFFICES"

THE plaintiff, a dentist licensed to practice in the State of Washington, operated a dental office in the city of Seattle. He desired to open another office in Tacoma under his own name, but under the management of another dentist, who would conduct a practice there. He frankly admitted that he would not be present in the Tacoma office, or operating as a dentist, or personally overseeing such operations as were performed in the office, during the greater part of the time that it would be in operation. The defendant, the director of licenses of the State of Washington, threatened to prevent the plaintiff from opening the second office, stating that, in so doing, the plaintiff would be violating section 18 of the dental practice act, which reads in part as follows:

> It shall be unlawful for any person to conduct a dental office in his or her name, or advertise his or her name in connection with any dental office or offices, unless such person is personally present in said office operating as a dentist or personally overseeing such operations as are performed in said office or each of said offices during a majority of the time said office or each of said offices is being operated: provided, however, that this section shall not prohibit any person from continuing to conduct any office or offices legally conducted in this state at the time this act takes effect.

The plaintiff then began the present action alleging that the dental practice act was unconstitutional and violated the due process clauses of both the constitution of the United States and the constitution of the State of Washington by depriving him of "life, liberty or property without due process of law." The defendant demurred, saying that the plaintiff had not stated a cause of action. The superior court sustained the defendant's demurrer and the plaintiff made the present appeal alleging that the trial court had erred.

In its opinion, the Supreme Court first quoted from a previous decision in which the court had ruled that if a law has a reasonable relation to the protection of public health, morals, safety or welfare, it is not to be set aside because it may incidentally deprive a person of his property without fault. The next question, then, is whether the dental practice act was enacted for the purpose of safeguarding the public health, and particularly the residents of the state as individuals, from the evils of incompetent and improper dental practices. It may be presumed that, in the opinion of the legislature, the conduct of a dental office under the name of one who, although a licensed dentist, was not personally present in the office the greater part of the time was a pernicious practice, tending to mislead persons patronizing such office in the expectation that the services sought and paid for would be personally rendered or supervised by the dentist whose name is held out to the public as conducting the dental office. The relationship between dentist and patient is inherently personal in the highest degree. If, in the opinion of the legislature, chain office dentistry and dental offices conducted under corporate or fictitious names, or under the name of a dentist who has nothing to do with the practice of the profession in connection with the carrying on of the office, tend to intro-

duce into the profession unscrupulous practices which might injure the health of the community and public welfare, the legislature had the power to enact the limitation in question.

The court concluded its opinion by discussing the plaintiff's contention that the section in question is unconstitutional because of the exception that is contained therein, reading: "Provided, however, that this section shall not prohibit any person from continuing to conduct any office or offices legally conducted in this state at the time this act takes effect."

The plaintiff contended that this exception violates the state constitution by creating a specially privileged class composed of those who were operating chain offices before the law was enacted. The court replied that this exception does not create special privilege based solely on the caprice of time. There are other factors than time which influence the classification. Persons within the exception have previously invested time, labor and capital in the establishment of chain offices when that form of practice was lawful, whereas a person just contemplating entering this activity has not made such an investment. Although this type of practice is admittedly against the public interest, the offices existing at the time of the enactment of the law will not continue in perpetuity, but will gradually die out. Since the law is within the police power and not unreasonable or discriminatory, the decision of the trial court was correct. Judgment affirmed.—Campbell *v.* State 122 P. 2d. 458, Wash. 1942.

CONTRACTS—RESTRAINT OF TRADE—PARTNERSHIP AGREEMENT

The plaintiff, a practicing dentist in Arkansas, had an established practice and was seeking some one to form a partnership with him. The defendant, who had been practicing in Missouri, received overtures from the plaintiff and subsequently entered into a partnership agreement with him. After about a year of practice under this agreement, the plaintiff gave the defendant ninety days' notice of termination of the partnership. At the end of this time, the defendant moved to another location in the city and began to practice on his own account, whereupon the plaintiff sought to enjoin him from practicing in the city. The plaintiff based his right to an injunction upon a clause in the partnership contract which read as follows:

16. Upon the expiration of this contract, or in the event of an earlier dissolution of this agreement, party of the second part agrees that he will not set up an office for the practice of dentistry within the city of Rogers for a period of five years from the date of dissolution or termination of this agreement.

The lower court refused to grant the injunction requested by the plaintiff and so he appealed to the Supreme Court of Arkansas.

It is shown by the testimony, said the Supreme Court, that the city in question has a tributary population of 10,000 with only three dentists, including the parties to this case, to serve it. This population, said the court, provides as much or more dental work than all three dentists can reasonably perform. The testimony also shows that the defendant gave up his practice in Missouri and spent $700 to equip himself to perform the contract.

There is no doubt, the court continued, that the plaintiff was entitled to terminate the contract at any time upon giving proper notice, which he did. His right to restrain the defendant from continuing to practice in the city, however,

depends on whether this phrase in the contract was a reasonable restraint of trade. Under this contract, nothing was bought and nothing was sold. There was no sale of good will or anything else, nor was there a contract of employment. On the contrary, the defendant, no doubt through his connection with the partnership for a period of about a year, added to the good will value, and this value he is asked to surrender without consideration or compensation.

It is our opinion, concluded the court, that the restriction imposed upon the defendant was greater than the protection of the plaintiff required and that it imposed an undue, and under the circumstances an inequitable, hardship on the defendant as there was no transfer of good will or other subject of property. Affirmed. Marshall *v.* Irby 158 S.W. 2d 693, Arkansas 1942.

LIABILITY OF HOSPITAL ASSOCIATION FOR ACTS OF DENTIST EMPLOYE

THE plaintiff entered into a contract with the defendant association by which the latter agreed to provide hospital, medical and dental services in return for a given fee paid by the plaintiff. Later, the plaintiff had to have a third molar extracted and was referred to a dentist by the hospital association. Following the extraction, the plaintiff developed an infection, which he alleged resulted from the negligence of the dentist, and he sued both the dentist and the hospital association. The trial court dismissed the suit as to the hospital association, and later the jury returned a verdict in favor of the dentist. The trial court subsequently ordered a new trial as to the hospital association, but not as to the dentist, and the hospital association appealed to the Supreme Court of Oregon.

The hospital association contended that it had performed its obligations under the contract when it exercised due care in the selection of a dentist. The plaintiff contended that the dentist was an agent of the association and therefore the association was responsible for any negligence of the dentist. The court was of the opinion that the verdict of the jury exonerating the dentist from the charge of negligence also exonerated the hospital association. The verdict in favor of the dentist destroyed the foundation of any case against the association.—Feazle *v.* Industrial Hospital Association (Ore.), 103 P. (2d) 300.

BRIGADIER GENERAL ROBERT H. MILLS APPOINTED HEAD OF THE ARMY DENTAL CORPS

BRIGADIER General Robert H. Mills was appointed Assistant to the Surgeon General, Chief of the Dental Division, March 17, 1942. General Mills, at the time of his appointment, was the second ranking colonel in the Dental Corps and the highest ranking colonel eligible for the appointment. His service includes duty in France with the American Expeditionary Forces, two tours of duty in the Philippine Department, assignment to the faculty of Northwestern University Dental School on R. O. T. C. duty and a four year assignment as director of the Army Dental School, Washington, D. C. With General Mills' rank and background, his appointment as Chief of the Dental Division, Office of the Surgeon General, was a most popular one.

MEMBERSHIP COMMITTEE

JUNIOR MEMBERSHIP ESSAY CONTEST

PURPOSE

The purpose of the Junior Membership Essay Contest is to promote interest in the Junior Membership of the American Dental Association.

PRIZES

The winning student of each zone will be given a trip to the next annual meeting of the American Dental Association with all expenses paid. These four zone winners will sit in the House of Delegates and other meetings as observers. On their return from the meeting, they will be required to write an article to be published in THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, covering their observations. This article is to be in the hands of the chairman of the Judges Committee of the Junior Membership Contest thirty days after the American Dental Association meeting.

ZONES

The United States has been divided into four zones for convenience in dividing the dental schools into groups, as follows:

Zone 1. Schools in Massachusetts, New York, Pennsylvania, Washington, D. C., Virginia and Maryland.

Zone 2. Schools in Michigan, Ohio, Indiana, Kentucky, Tennessee and Georgia.

Zone 3. Schools in Minnesota, Wisconsin, Iowa, Illinois, Missouri and Louisiana.

Zone 4. Schools in Nebraska, Texas, Oregon and California.

ELIGIBILITY

A. The candidate must be a member of the Junior American Dental Association.

B. He must be a member of the junior class of the dental school that he represents.

C. He must be qualified as a student, an organizer or leader and show proficiency in his studies.

PROJECT

A. The project is an essay on "The Value of Dental Organization."

B. The essay must not exceed 1,000 words.

C. All essays submitted must be postmarked not later than May 31, 1942.

D. All entries shall be typewritten, double-spaced and on one side of paper.

E. Each entry shall be accompanied by a certification of the dean of the school stating that it is the work of the qualified representative of the junior dental class of the school.

SELECTION OF CANDIDATE

A. The cooperation of the dental schools is solicited in the selection of the candidate representing the junior dental class.

B. Selection of the candidate shall be made as the school sees fit.

C. The following are methods that may be used as a guide:

a. Selection by the dean of the school.

b. Selection by the faculty or an appointed committee.

c. Election of a candidate by the junior class.

d. Selection through competition of all junior class members of the Junior American Dental Association in writing essays, these to be judged by a committee of the faculty.

All entries are to be mailed to the Chairman of the Judges Committee of

the Junior Membership Contest on or before May 31, 1942.

Harry A. Allshouse, *Chairman,*
6333 Wyandotte, Kansas City, Mo.
Harold W. Alden
Charles J. Baumann
Robert R. Gillis
Charles F. Gray
PAUL W. ZILLMAN, *Chairman,*
Membership Committee.

RESEARCH COMMISSION

MIDYEAR REPORT OF THE RESEARCH COMMISSION FEBRUARY 1942

To the Officers and Members of the Board of Trustees of the American Dental Association: The work of the Research Commission at the National Bureau of Standards has been curtailed 50 per cent because of the war situation. This was done under the direction of the chief of the Bureau of Standards, Lyman J. Briggs, as expressed in a letter to the Commission under date of December 20, 1941.

The Commission is now without the services of William T. Sweeney and the authorities at the Bureau of Standards have advised us not to replace him for the present.

George C. Paffenbarger has been called to active duty in the United States Navy as a lieutenant commander and is now stationed at the U. S. Naval Medical Supply Depot, Brooklyn, N. Y.

Mr. Beall and Mr. Caul are carrying on our regular testing program, but very little investigative work can be started.

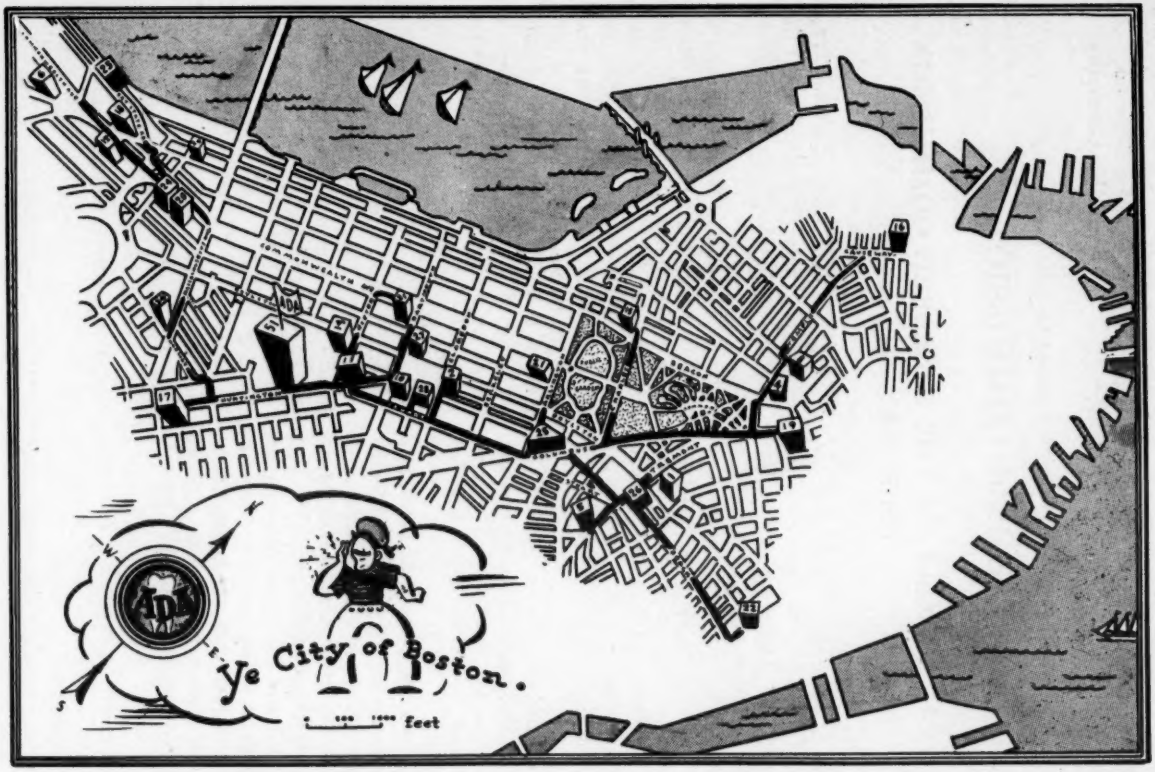
The Commission has received a grant of $250 from the American Full Denture Society for special work in acrylics. This money has been deposited with the Treasurer of the American Dental Association.

The Fellowship in Dental Diseases at the National Institute of Health is developing satisfactorily. Dr. Hampp, our research associate, is carrying on studies on Vincent's disease under the direction of H. Trendley Dean. This work may be of tremendous value as the war progresses. It is well that these studies have been started so early. The Commission looks forward to productive and permanent results.

In addition to this problem, a study of the ameloblastoma is being undertaken by Dr. Hampp by the method of microincineration. This work was begun while he was at Washington University and it seemed desirable to complete the study.

M. D. HUFF, *Chairman,*
DANIEL F. LYNCH, *Secretary.*

Washington, D. C.
February 16, 1942.



1. HOTEL AVERY. 2. HOTEL BRUNSWICK. 4. HOTEL BELLEVUE. 5. HOTEL BRADFORD. 6. HOTEL BUCKMINSTER. 8. HOTEL COMMONWEALTH. 10. THE COPLEY PLAZA. 11. COPLEY SQUARE HOTEL. 12. KENMORE HOTEL. 14. HOTEL LENOX. 15. HOTEL LINCOLNSHIRE. 16. HOTEL MANGER. 17. HOTEL MINERVA. 18. THE MYLES STANDISH. 19. THE PARKER HOUSE. 20. HOTEL PURITAN. 21. THE RITZ CARLTON. 22. HOTEL ESSEX. 23. THE SHERATON. 24. THE SOMERSET. 25. HOTEL STATLER (A. D. A. HEADQUARTERS HOTEL). 26. HOTEL TOURAINE. 27. HOTEL VICTORIA. 28. HOTEL WESTMINSTER. 29. HOTEL FENSGATE. 30. HOTEL GARDNER. 31. HOTEL VENDOME. 51. MECHANICS BUILDING (EXHIBITS AND SECTION MEETINGS).

American Dental Association
84th ANNUAL MEETING

★

PLAN now to attend the Eighty-Fourth Annual Meeting of the American Dental Association in Boston, August 24 to 28—the first A.D.A. meeting since the United States entered the war.

Naturally, this year, all general sessions, section meetings and exhibits will emphasize the "do-first-things-first" wartime order of the day and will lend significant impetus to the efforts every dentist is being called upon to expend in helping to win the war.

Section officers and general arrangements chairmen are making every effort to shape all phases of the meeting so that they may contribute to the general tenor of "service in wartime."

The site of the convention is particularly well-chosen for this historic meeting, since Boston is the "birthplace of American Liberty." There could be no better occasion than the Boston meeting, August 24 to 28, for dentists to gain knowledge and inspiration for professional practice in a time of the greatest national emergency.

★

Send reservations immediately to

MAURICE E. PETERS, Chairman,
Halls and Hotels Committee

American Dental Association Convention Headquarters

Room 554, Statler Hotel, Boston, Mass.

HOTEL STATLER (A.D.A. HEADQUARTERS HOTEL). 26. HOTEL TOURAINE. 27. HOTEL VICTORIA. 28. HOTEL WESTMINSTER. 29. HOTEL FENSGATE. 30. HOTEL GARDNER. 31. HOTEL VENDOME. 31. MECHANICS BUILDING (EXHIBITS AND SECTION MEETINGS).

American Dental Association

Boston, Mass. **August 24-28, 1942**

HOTEL RESERVATIONS

To secure hotel accommodations for the 1942 Session, consult the rate list on the next page and fill out the attached blank. Mail this immediately to the hotel of your first choice or to the Housing Committee, Room 554, Hotel Statler, Boston, Mass. Confirmation will be sent to you by the hotel.

Second and third choices of hotel should be indicated. If the reservation cannot be made at any of the hotels of your choice, the Housing Committee will place you in as favorable a hotel as possible and will notify you.

Please remember that a reservation constitutes a contract with the hotel to provide you with the accommodations you desire. If you find it impossible to carry out your part of the contract, namely, to occupy the room at the time agreed upon, please write or wire the hotel releasing the room, in order that it may be available for other members.

APPLICATION FOR HOTEL ACCOMMODATIONS

AMERICAN DENTAL ASSOCIATION

Boston, Mass. August 24-28, 1942

HOTEL.....1st Choice

HOTEL.....2nd Choice

HOTEL.....3rd Choice

Kindly reserve the following: ☐ Single room ☐ Double room ☐ Twin beds.

.....rooms with bath for.....persons $.....per room

.....rooms without bath for.....persons $.....per room

Arriving on August.....at.....a.m.....p.m.

ROOMS TO BE OCCUPIED BY:

NAME	ADDRESS IN FULL
.....	.....
.....	.....
.....	.....

NOTE TO HOTEL NAMED AS FIRST CHOICE: If the hotel of first choice is unable to make the reservation requested, this application should be forwarded at once to the Housing Committee, Room 554, Hotel Statler, Boston, Mass.

SCHEDULE OF RATES

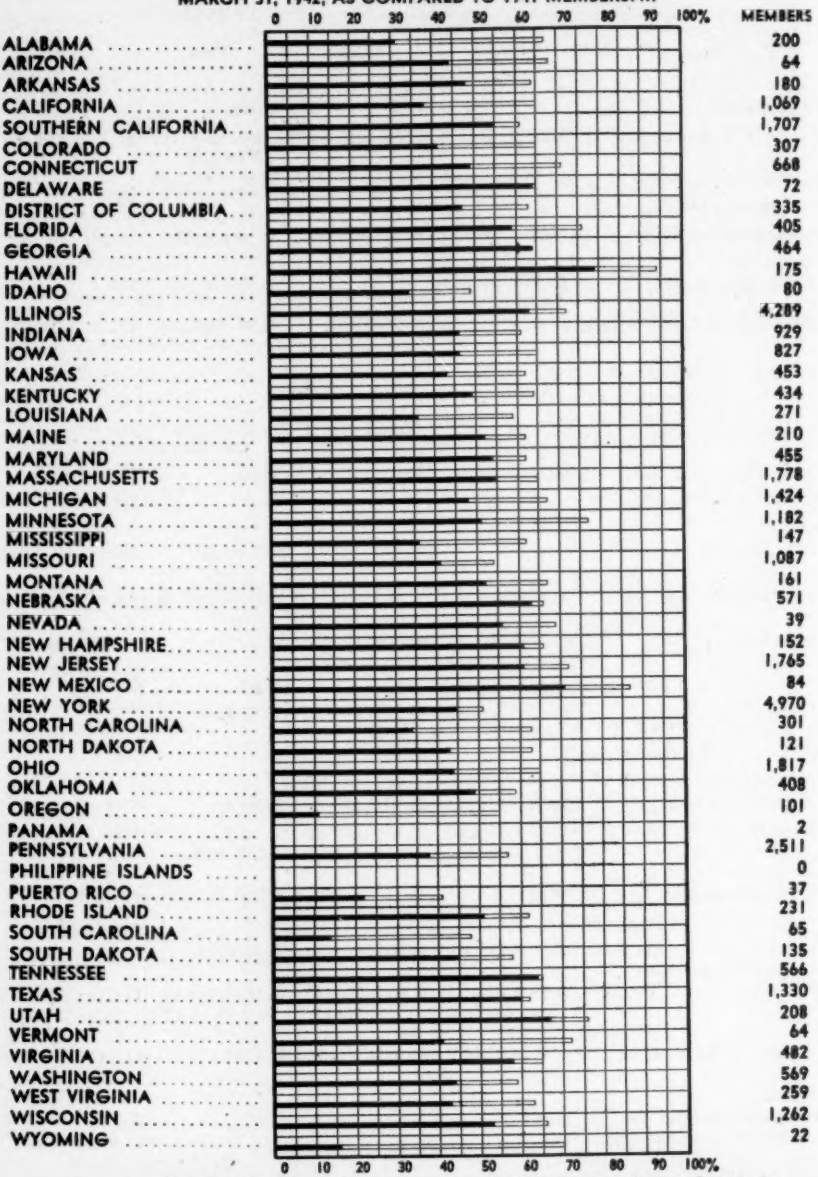
ALL ROOMS WITH BATH*

Hotel	Single	Double	Twin	Suite
AVERY, 24 Avery St.		$5.50	$6.60	
BELLEVUE, 21 Beacon St.	$3.85–4.40	$4.95–5.50–6.60	$5.50–6.60–7.15–7.70–8.80	$8.25–8.80–9.90
BRADFORD, 275 Tremont St.	$3.30–3.85–4.40	$5–5.50	$5.50–6.60–7.70	
BUCKMINSTER, 645 Beacon St.		$5		$7–12
COMMANDER, Cambridge, Mass.	$3.30–3.85–4.40	$4.40–5–5.50	$5.50–6–6.60	
CONTINENTAL, Cambridge, Mass.	$3.30–3.50–3.85–4.40	$5.50–6	$5.50–6.50	$10
COPLEY PLAZA, Copley Square	$4.40–5.50–6.60	$7.70–8.80	$8.80–9.90–11–13.20	$13.20–15.40–17.60–19.80–22–24.20–27.50
COPLEY SQUARE, 47 Huntington Ave.	$2.75–3–3.30	$4.40–4.95–5.50–6	$5.50–6–6.60	$8–10
ESSEX, 695 Atlantic Ave.	$2.75–3.30	$4	$5.50	$7.70–8.80
FENSGATE, 534 Beacon St.			$5–8	$12–14
GARDNER, 199 Massachusetts Ave.		$4.40	$4.95–5.50	$6.60–8.60–10.60
KENMORE, 490 Commonwealth Ave.	$3.85–4.40		$5.50–6.60–7.70–8.80	$10
LENOX, Exeter St.	$3–3.50–4	$4–5–6	$5–6–7	$6.60–7.50–10–12–14
LINCOLNSHIRE, 20 Charles St.	$3.85		$6.60	$10–16
MANGER, North Station	$2.75–3.30–3.85–4.40	$3.85–4.40–4.95–5.50	$5.50–6.60	
MINERVA, 214 Huntington Ave.	$3	$4.50	$5	
MYLES STANDISH, 30 Bay State Road	$3.30–3.85	$4.50–5.50	$5.50–6	$7–8
PARKER HOUSE, 60 School St.	$3.85–4.25–4.40–4.95–5.50–6	$5.50–6.15–6.60–7.15	$6.60–7.15–7.70–8.80–9.90	$12–15
PURITAN, 390 Commonwealth Ave.	$4.40		$7.70	$9–12–14
RITZ CARLTON, 15 Arlington St.	$5		$8–9	$12–22–28
SHERATON, 91 Bay State Road	$3.30–3.85	$5.50	$5.50–6.60	$7.70–8.80
STATLER (Headquarters), Park Square	$3.85–4.40–4.95–5.50–6.60–8.80	$5.50–6.05–6.60–7.15–7.70–8.80–11	$6.60–7.70–8.80–9–9.35–10–12	$14.60–14.70–16.80–18–20–22–24.50–26.50
TOURAINE, 62 Boylston St.	$3.85–4.40–5–5.50–6	$5.50–6–6.50–7	$6–6.50–7.25–8.25	$12–14
VENDOME, 160 Commonwealth Ave.	$3.30		$5.50	$10
VICTORIA, 271 Dartmouth St.		$5		$7.50–10

*Rates on rooms without bath on request.

Membership Page

PERCENTAGE OF DUES RECEIVED IN CENTRAL OFFICE AS OF MARCH 31, 1942, AS COMPARED TO 1941 MEMBERSHIP



Percentage based on dental population figures supplied by the State Society Secretaries.

1942 percentage. 1941 percentage.

THE AMERICAN DENTAL FOUNDATION

THE American Dental Foundation, Inc., was organized for the purpose of receiving funds to be used in the promotion of research or such other objectives as may from time to time seem desirable in advancing the scientific and educational interests of the dental profession.

As one way to increase these funds, contributions are invited from members of the profession in memory of a colleague or friend. Instead of sending flowers, a donation is made to the Foundation, the family being notified to that effect by the secretary. In this way, a friend or co-worker is honored and the dental profession made a more effective agency for public-spirited service.

ARTHUR H. MERRITT, *President.*

In the records of the Foundation, memorials have been recorded for the following:

Mr. N. Randall Ellis, San Francisco, Calif.
Dr. Albert Hallenberg, Fargo, N. D.
Mrs. E. A. Litchfield, Omaha, Nebr.
Mr. George F. Stoll, Oakland, Calif.
Dr. Sed A. Harris, Snyder, Texas.
Dr. E. D. Drew, Livingston, Texas.
Mr. C. M. Becraft, Dowagiac, Mich.
Dr. Saul L. Scott, Greenville, Miss.
Dr. Claude A. Moore, Lexington, Miss.
Mrs. M. M. Anthony, Columbus, Ga.

Following is a list of those who have contributed for memorials:

W. H. Robinson, Oakland, Calif.
O. A. Runyan, Omaha, Nebr.
Arthur H. Merritt, New York, N. Y.
E. H. Bruening, Omaha, Nebr.
Texas State Dental Society.
New Jersey Delegation at Houston Meeting.
H. E. Summers, Huntington, W. Va.

Dentists of St. Louis:

J. Floyd Alcorn	O. W. Brandhorst
Albert Jacobsmeyer	R. L. Johnson
A. H. Jones	O. A. Kelly
E. H. Keys	Virgil Loeb
R. H. Main	Leo Marré
R. H. Miller	E. B. Owen
Earl Poe	Carl Pollock
Ralph Rode	Leo Shanley
William Spotts	D. F. Steber
V. P. Thompson	Joseph H. Williams
Lloyd Wright	David Block

Members of the staff of the American Dental Association:

H. B. Pinney	G. D. Timmons
L. W. Morrey	Samuel R. Lewis
Bess L. Kime	Eleanor Dufour
George Hansen	D. A. Wallace
O. T. Evans	Sam Garite
H. L. Hansen	L. T. Claridge
H. H. Horner	Helen Gabris
Nell McInerny	Josephine P. Hunt
Vida Kramer	Mae Johnson
Gertrude Daniels	Velma Child
Kathryn Lipke	Murle Borchardt
Marian Luehring	Zana Anderson

Michigan State Dental Society.
Arthur J. Buff, Topeka, Kan.
John E. Morgan, Emporia, Kan.
Leon R. Kramer, Topeka, Kan.
Fred A. Richmond, Kansas City, Kan.

A number of the foregoing have made more than one contribution.

Amount received to date, $1,140.50.

OBITUARY

ANDREW J. McDONAGH
(1867-1942)

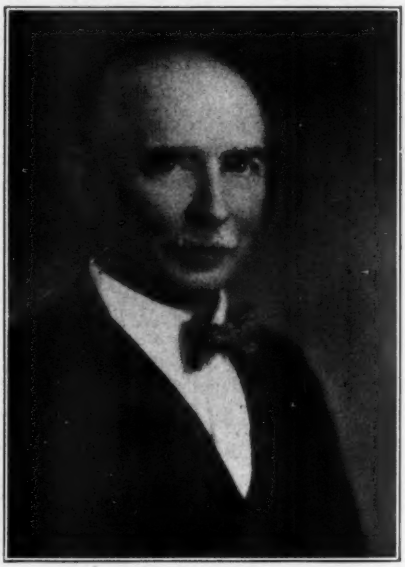
ANDREW J. McDONAGH died on Tuesday, February 10, at the age of 75, a faithful and highly respected member of the profession.

He was born in Lanark County, Ontario, in February 1867 and received his preliminary education at Napanee. Coming to Toronto, he entered the Royal College of Dental Surgeons, from which institution he was graduated as a licentiate in dental surgery. He served for a considerable number of years upon the staff of his Alma Mater as professor of crown and bridge prosthesis, then as a lecturer, clinician and professor of periodontology, holding the first chair that was ever established in a dental school in this subject.

Dr. McDonagh practiced dentistry in Toronto for more than half a century and, in all that time, scarcely a day passed without there being recorded to his credit some definite piece of work for the relief or prevention of human suffering. As a teacher, he had a wide reputation, and many dental practitioners throughout the country recognize their debt to him for what they have learned and been able to put into practice. He was an inventor of dental instruments, some of them used by general practitioners and those who specialize in periodontology. He was a convincing clinical teacher and enjoyed the respect of all who were fortunate enough to be his pupils.

Research work held his great interest. He was ever ready not only to devote a great deal of his own time in this field of activity, but also to encourage young men to devote their talents to this valuable field.

In the course of his career, Dr. McDonagh's interests apart from practice were nearly all directly connected with his profession. He was chairman of the Research Committee of the Canadian Dental Association; head of the dental clinic of St. Michael's Hospital; founder of the Canadian Oral Prophylactic Association; past president of the American Academy of Periodontology and the International Association for Dental Research (Canadian Division); honorary life member, Ontario Dental Association and the Toronto Academy of Dentistry, and member of the Senate of the



ANDREW J. McDONAGH
1867-1942

University of Toronto and the Royal Canadian Institute.

He was an active man outside of dentistry in that he was a member of a business men's association; the Royal Canadian Institute, the Empire Club of Canada and the Rosedale Golf Club of Toronto.

Burial, February 12, was from St. Basil's Church, where he had been for many years an active and faithful member.

DON W. GULLETT.

DEATHS

ATTERBURY, JAMES G., Seattle, Wash.; North-Western University Dental School, 1901; died March 16; aged 63.

BALLENGER, CURTIS MURRAY, Lubbock, Texas; Vanderbilt University School of Dentistry, 1904; died March 11; aged 69.

BENDER, CHARLES H., Philadelphia, Pa.; Philadelphia Dental College, 1901; died recently.

BLACK, ROY E., Huntingdon, Pa.; Philadelphia Dental College, 1904; died March 7; aged 59.

BOWEN, FRANK L., Johnstown, Pa.; University of Pennsylvania School of Dentistry, 1916; died February 5; aged 50.

CHAITOVITZ, JAMES, New York, N. Y.; New York College of Dentistry, 1919; died January 8.

COPP, GEORGE H., Plainwell, Mich.; University of Michigan School of Dentistry, 1890; died January 20; aged 72.

CRAFT, WILLIAM HARRISON, Coalport, Pa.; Ohio College of Dental Surgery, 1883; died November 6; aged 84.

CUTTING, ALMOND J., Southington, Conn.; Baltimore College of Dental Surgery, 1884; died March 5; aged 85.

DEBE, WILLIAM E., Waterloo, Iowa; Chicago College of Dental Surgery, 1898; died January 7; aged 63.

FRANKFURTH, CHARLES E., Detroit, Mich.; Detroit College of Medicine, 1907; died December 10.

GABEL, CLAYTON G., Lancaster, Pa.; Philadelphia Dental College, 1886; died February 23; aged 77.

GEHBE, FRANK H., Manitowoc, Wis.; Chicago College of Dental Surgery, 1895; died February 14; aged 66.

HEBERLING, HOMER, Lehighton, Pa.; Philadelphia Dental College, 1886; died February 23; aged 71.

HEGG, CLARENCE EDWIN, Seattle, Wash.; University of Minnesota School of Dentistry, 1926; died March 23; aged 41.

HERTRICH, VICTOR ANTHONY, Aberdeen, Wash.; Creighton University Dental School, 1924; died recently; aged 41.

JORDAN, STANLEY L.; Seattle, Wash.; University of Pennsylvania School of Dentistry, 1901; died March 3; aged 63.

KELLY, MERRITT J., Davenport, Iowa; Indiana University School of Dentistry, 1884; died January 11; aged 82.

MARCUS, ALBERT W., Detroit, Mich.; Detroit College of Medicine, 1889; died December 27.

MARSHALL, J. A., Flint, Mich.; Detroit College of Medicine and Dentistry, 1903; died February 4; aged 62.

MCCURDY, HOWARD A., Fort Wayne, Ind.; Indiana University School of Dentistry, 1929; January 16; aged 35. Captain McCurdy was killed in action in the Philippines with General MacArthur's forces defending Manila.

MITCHELL, NOBLE F., New Albany, Ind.; University of Louisville School of Dentistry, 1904; died March 3.

MOORE, EDWARD C., Elgin, Ill.; Northwestern University Dental School, 1901; died February 7; aged 68.

REQUE, WILLIAM A., Chippewa Falls, Wis.; State University of Iowa College of Dentistry, 1896; died October 24; aged 69.

RYAN, EARL V., Peoria, Ill.; St. Louis University School of Dentistry 1919; died November 30; aged 46.

SOMERS, JESSE LEROY, Havre, Mont.; State University of Iowa College of Dentistry, 1915; died January 21; aged 55.

SULLIVAN, EDWIN O., Chicago, Ill.; University of Louisville College of Dentistry, 1897; died January 21; aged 66.

TELFER, DAVID A., Wisconsin Rapids, Wis.; Temple University School of Dentistry, 1892; died December 30; aged 77.

THOMAS, EDWARD H., Philadelphia, Pa.; University of Pennsylvania, School of Dentistry, 1929; died January 2; aged 36.

THOMPSON, CLAUDE HENRY, Cincinnati, Ohio; College of Dental Surgery, 1892; died October 13; aged 74.

TRUEB, WILLIAM O., Evansville, Ind.; University of Louisville, School of Dentistry, 1917; died recently; aged 46.

WOODWORTH, LEIGH J., Janesville, Wis.; Marquette University Dental School, 1915; died February 11; aged 51.

WRIGHT, GEORGE HENRY, Boston, Mass.; Harvard University Dental School, 1903; died October 18; aged 71.

ZIMMERMANN, EDWARD A., Chicago, Ill.; Northwestern University Dental School, 1917; died February 14; aged 48.

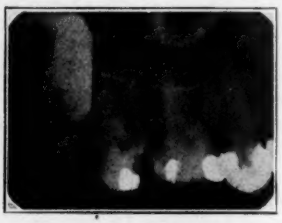
QUESTIONS AND ANSWERS

The answers here published have been prepared by authorities, but do not represent the opinion of the American Dental Association as an organization or of any other official bodies unless specifically stated in the reply.

FOURTH MOLAR

To the Editor: The accompanying roentgenogram indicates a fourth molar present. The patient came in for extraction of a second molar and routine x-ray procedure disclosed the hidden molar. I also extracted the third molar, which I am enclosing. The root is pretty well formed, though the surface is irregular.

There was no indication of the fourth molar in the mouth, no part of it being exposed to view, and no openings in the gum which would lead to the tooth were apparent in exploring the area with a probe.



Upper right third molar.

Still it seems to me that the condition of the crown of this fourth molar indicates that considerable decay is present. I would be interested in having this verified.

D. WEINSTEIN, D.D.S.,
New York, N. Y.

ANSWER

There has been much discussion as to the possibility of dental caries developing in completely embedded teeth, but it seems well established that caries cannot occur unless there is some connection between the tooth and the oral cavity. Destruction of the tooth structure of embedded teeth is often seen, but by resorption from osteoclastic action rather than by decalcification and destruction by bacterial invasion. For more detailed information, read an article "So-Called 'Intrafollicular Caries,'" by W. G. Skillen *(Illinois D. J.,* 10:307, August 1941.) Careful examination of the roentgenogram and the tooth submitted yields no evidence of dental caries in either the third or the fourth molar.

Thank you for submitting the interesting roentgenogram and tooth. Fourth molars are rare enough to be worthy of note.

LEUKEMIA AND EXTRACTION

To the Editor: At a recent hospital staff meeting, the pathologist stated that leukemia can be caused by the extraction of a tooth. I represent the dental society on the staff and would like to contribute something to the meetings to maintain the prestige of the dental profession. I read a good deal of the dental literature, but understand that nothing is known of the cause of leukemia. Dental responsibility in possible malpractice suits might arise some day if this pathologist is correct.

C. H. P., D.D.S.,
Urbana, Ill.

ANSWER

There is nothing to support the idea that extraction of a tooth can cause leukemia. Extractions are so very common and the leukemia is so rare that certainly leukemia following extraction of teeth must be considered purely coincidental. It must be remembered that oral manifestations of leukemia are common and may be present early in the course of the disease. Occasionally, because of these oral manifestations, the patient visits a dentist. If the dentist extracts a tooth, extensive hemorrhage may result, and the patient may go to a physician and the diagnosis of leukemia be

established. Of course, the leukemia was present before the extraction was made, but was not recognized.

The etiology of leukemia is completely unknown. The condition is considered a tumor by some and an infection of unknown variety by others.

M. K. H.

BACTERIA IN ACUTE ALVEOLAR ABSCESSES

To the Editor: This question has come up in our medical staff meetings: "What are the predominating bacteria present in an acute edematous area in the jaws developing from an abscessed tooth?" I have found cases wherein the white blood count has dropped from 11,000 to 5,000 or 6,000 within forty-eight hours after extraction, and in only two cases have we resorted to sulfonamide medication. One case showed streptococci after a short period of staphylococcus predomination. In our hospital, we have difficulty in holding these cases for the needed time for sulfonamide treatments. Would you advise starting such treatments before operating if possible, and which sulfonamide? We will develop cultures in the near future, but I have been able to find little as to prevailing bacteria in putrescent pulps and the subsequent periapical involvement.

F. H. C., D.D.S.,
Ganado, Ariz.

ANSWER

Studies of the bacteriology of acute alveolar abscesses are few. Our investigations, and most of the reports in the literature, indicate that the predominating bacteria in acute alveolar abscess are staphylococci. Usually, the only treatment required is incision and drainage followed by extraction of the tooth or root canal therapy after the acute symptoms have subsided. Several of the sulfonamide drugs (usually, sulfadiazene or sulfathiazole) have been used as an adjunct to the foregoing treatment, but, as suggested in the letter above, it is often difficult to carry out this treatment satisfactorily and it is seldom required. Under proper supervision, use of these drugs as early in the treatment of the case as possible would probably shorten the course of the infection. It is unwise to recommend use of any of the sulfonamide drugs promiscuously. Some clinicians here first administer sulfadiazene for severe staphylococcus infections, and, if the results are not satisfactory, shift to sulfathiazole. However, no one that I know has handled a great number of cases in this way. For a review of the uses of sulfonamide drugs in dentistry, see "Para Nitrobenzoic Acid in Oral Surgery," by Griffith, Hirschfelder and Simon. (THE JOURNAL, 29:49, January 1942.)

The bacteriology of putrescent pulps and chronic dental granulomata has been more carefully studied. The predominating bacteria is *Streptococcus viridans,* although a great variety of organisms have been isolated from such cases. Hot saturated solutions of sulfanilamide applied locally have been used with some success in the treatment of dental pulps, but, as far as we know, the drug has not been given orally and would probably be ineffective. Perhaps the best study of the bacteriology of pulpitis is to be found in "Bacterial Infection" by J. L. T. Appleton, pages 459 to 472.

M. K. H.

CURRENT LITERATURE

A Five Year Clinical Study of Factors Affecting First Dentition

By H. E. THELANDER

THE incidence of caries in the deciduous dentition of seventy-eight children attending a health center from infancy was studied and compared to determine possible predisposing or direct etiologic factors. At the age of about 6, the children were divided into three groups: (1) those having nearly perfect dentition, (2) those having from one to five cavities and (3) those having rampant caries. The condition of the mother's teeth, and the age and general health of the mother; the conditions associated with the pregnancy and the environment, and the intake of sugar seemed to be closely correlated with the differences between groups 1 and 3.—*J. Pediat.*, **20**:187, February 1942.

H. B. MCCAULEY.

Further Studies in Mineral Metabolism of Human Teeth by the Use of Radio-Active Phosphorus

By J. R. BLAYNEY, F. WASSERMANN, G. GROETZINGER and T. G. DEWITT

SODIUM phosphate containing radioactive phosphorus was dissolved in water and used as a mouth rinse in order that the radioactive element might be brought into intimate contact with the teeth. After the patient had rinsed the mouth with this solution for a few minutes, four teeth were extracted. One gave no indication of caries, and three had definite carious lesions. It was found that the intake of minerals from the saliva by the enamel of a caries-free tooth is very small. This intake is about 100 times as large when part of the enamel is missing. An appreciable intake of mineral substances from the saliva by the enamel takes place only if the substances can enter from the inner surface of the enamel. In substances administered by mouth, the intake of minerals by the enamel of a normal tooth takes place to the greatest extent through pulp and dentin, while the direct intake of the substance from the outer surface of the enamel is comparatively small.

Periodontitis seems to decrease the exchange of mineral substances through the cementum. In pulpless teeth, periodontitis also decreases the exchange of minerals in the dentin. These results indicate that the exchange of minerals through the peridental membrane decreases as a result of periodontitis.—*J. D. Res.*, **20**:559, December 1941.

JAMES T. GINN.

Chemotherapy in the Management of Ludwig's Angina

By J. E. CONWAY

THE growth of hemolytic streptococci following the extraction of a lower tooth is usually responsible for Ludwig's angina. The term should be confined to inflammatory processes involving the floor of the mouth and as deep as the mylohyoid diaphragm. Elevation of the tongue, singular or bilateral induration of the submaxillary regions and involvement of tissue planes as boundaries for the process are typical findings. Although wide incision and drainage are the usual treatment, the histories of three cases classified as true Ludwig's angina indicate that the administration of sulfathiazole under favorable circumstances may bring about recovery without surgical intervention. Chemotherapy is indicated in the absence of immediate indications for surgical intervention, such as respiratory embarrassment, late fluctuation and severe constitutional disturbance.—*J.A.M.A.*, **118**:953, March 21, 1942.

H. B. MCCAULEY.

Osteomyelitis Arising from the Periodontium

By R. H. IVY and T. J. COOK

IN a case of acute infectious osteomyelitis arising from the periodontium, it is believed that trauma from a toothpick played an important rôle. The removal of teeth has been closely associated with osteomyelitis of the jaws, but, as this case indicates, osteomyelitis can develop when teeth have not been re-

moved.—*Am. J. Orthodontics,* 28:86, February 1942.

J. E. GILDA.

Adenocarcinoma of the Maxilla

By K. H. THOMA

ADENOCARCINOMA, which is among the rare tumors of the mouth, is more common in the maxilla than in the mandible, and it is much less common and less malignant than epidermoid carcinoma. In five cases involving the maxilla, the invasive character of the tumors and their tendency to recur after operation, with extension into the paranasal sinuses, were demonstrated. The occurrence of metastases to bones and viscera is confirmed. Adenocarcinoma should be given prompt and radical treatment, a combination of wide excision, including the adjacent bone, followed by irradiation. Since local recurrences are common, examination at regular intervals for at least five or ten years is indicated.—*Am. J. Orthodontics,* 28:65, February 1942.

J. E. GILDA.

Some Histologic Facts Useful in Orthodontic Practice

By BERNHARD GOTTLIEB

THE normal compression of the periodontal membrane causes resorption of the alveolar bone immediately adjacent to the periodontal membrane (frontal resorption). When this pressure is exceeded, the peridontal membrane is necrotized so that bone is not resorbed. At some point along the periphery, the compression decreases to such a degree that resorption of the bone from the rear is initiated (rear resorption). This continues and is followed by removal of the necrotic material and complete repair. After possible tooth resorption, a repair layer of cementum is deposited and periodontal connection with the bone is reestablished.—*Am. J. Orthodontics,* 28:167, March 1942.

J. E. GILDA.

Congenital Syphilis and Malocclusion of the Teeth

By F. R. STATHERS

IN a group of 100 congenitally syphilitic aged from 3 to 43 years under treatment for interstitial keratitis, no particular type of malocclusion occurred with sufficient frequency to be considered characteristic. While open-bite was frequent, it seemed to occur only if the disease had been severe enough to affect jaw development. When there was no hypoplasia, the overbite was normal. Edge-to-edge, or slight overlapping, bite was probably due to a disturbance in the development of the teeth themselves, since the jaw development was normal. Spacing of the incisors was not typical and, when present, could not be explained by the reduction of the lateral diameters of the teeth. A diverging arch with narrow curved anterior segment and straight diverging sides was most common. The high-arched palate usually associated with congenital syphilis was rare. The mandibular arch, in many cases, had a tendency toward squareness of the anterior portion, with a general increase in size throughout. The incidence of missing teeth, particularly the maxillary second incisors, was not nearly so high as expected, and tends to discount congenital syphilis as a factor.—*Am. J. Orthodontics,* 28:138, March 1942.

J. E. GILDA.

Relative Toxicity of Certain Antiseptics Containing Soap and Alcohol, with Special Reference to Mouth Washes

By H. WELCH and C. M. BREWER

A TOXICITY index can be secured by dividing the greatest dilution of the compound under test that is toxic for tissue (destruction of phagocytic function of the leukocyte) by the greatest dilution capable of killing the test organism. This affords a ready reference as to the toxic effect of compounds studied, since any chemical more destructive to leukocytes than to bacteria is very unlikely to be effective as a direct antiseptic in a septic wound.

It was found that the addition of alcohol to a solution of phenol increased the toxicity index. A very marked increase in the index occurred when soap was added to phenol solutions. The relatively high index resulting from the addition of soap was demonstrated with several phenolic compounds and essential oils. The toxicity of alcohol and soap was obtained for comparison. The toxicity and germicidal power of eighty-seven commercial mouthwashes have been determined. Only nine of these were found to be germicidal under the conditions of test, while sixty-two were toxic in 1:5 dilution; fourteen were toxic in 1:10

dilution; two were toxic in 1:15 dilution; five were toxic in 1:20 dilution, and one each was toxic at dilutions of 1:25, 1:30, 1:40 and 1:50. The toxicity-index method can be applied to the evaluation of antiseptics.—*Am. J. Pub. Health* 32:261, March 1942.

DAVID S. K. DAI.

A Practical Dental Prescription Formulary

By A. J. NORVAK

THE ability to write a correct prescription is as important to the dentist as it is to the physician. Prescriptions for conditions met in every-day practice should be given to avoid the injudicious use of drugs in part resulting from confusion created by newly marketed remedies. A prescription given by the dentist will increase the patient's confidence in him and often will have a decided beneficial psychologic effect. At the same time, self-medication is discouraged and accurately controlled doses are administered. Administration of sodium pentobarbital before operation will combat anxiety and shock, especially in the cardiac or highly nervous patient. An acetophenetidin-acetylsalicylic acid combination is recommended as a postoperative analgesic. Sialogogue, antisialogogue, antiseptic swab and mouth wash prescriptions for many common oral conditions are included.—*Am. J. Orthodontics,* 28:156, March 1942.

H. B. MCCAULEY.

Fractures of the Maxilla

By C. W. WALDRON and S. G. BALKIN

SOME cases of fracture of the maxillae involve only a small portion of the bone; others include the major portions of both sides of the upper jaw. In the extreme cases, care should be taken not to work too quickly, especially in the molar-orbit-ethmoidal level, because infection may extend into the meninges.

If displacement is extreme, particularly in cases of depression of the molar region with open-bite anteriorly, replacement by manipulation and wiring is impossible. In such cases, a head appliance, making possible the application of craniomaxillary force, is indicated. The authors recommend a simplified head appliance of strong adjustable cotton bands, securely sewed to temporal pads and plates. Upon these pads, universal joints are secured which connect by vertical rods with adjustable horizontal extra-oral arms, the ends of which slip into rectangular tubing attached to an arch for a maxillary dental splint. The apparatus is easily applied and has been found very satisfactory for reduction and fixation.—*Surgery,* 11:183, February 1942.

VERNON H. POWELL.

Tularemia with Local Lesions Confined to the Tonsils

By W. W. WADDELL

A CASE of tularemia with local lesions confined to the tonsils is reported in a 6-year-old white girl who had helped to skin several rabbits. For four weeks prior to hospital admittance, fever, headache, sore throat and general malaise were noted. In the hospital, the illness progressed and the tonsillitis became more marked. The general appearance strongly suggested typhoid fever, except for the unusual appearance of the tonsils, which were markedly inflamed and extremely swollen. The tonsillar crypts were filled with exudate. The cervical glands were moderately swollen and tender. The course of illness (thirty-five days) continued to be that of a sepsis, requiring repeated blood transfusion. The tonsillar lesions were characterized by a slight tendency toward healing with the picture not unlike that seen at times in certain blood dyscrasias.—*J. Pediat.,* 20: 368, March 1942.

PETER P. DALE.

Calcium Intake and Fluorine Poisoning in Rats

By S. RANGANATHAN

OF eleven groups of six young growing albino rats each, some were placed upon diets containing levels of calcium varying from less than 0.1 per cent to 0.7 per cent. Sodium fluoride was added to these diets to the amount of 0.05 per cent. Other groups received a constant low calcium intake (0.1 per cent), while the dose of fluoride was varied. In two series, natural foodstuffs were substituted in place of calcium salts. The survival time and the weight changes of the animals during the experimental period of either 280 or 336 days were the criteria of toxicity.

Fluorine was highly toxic when the dietary intake of calcium was low or insufficient for

the body needs of the animals. The addition of increasing doses of calcium salts to the diets containing a constant percentage of fluorine correspondingly inceased the survival period of the animals. Calcium administered in natural foodstuffs likewise exerted a mitigating effect. Progressively decreasing doses of fluorine with a diet low in calcium proportionately increased the survival rate.—*Indian J. M. Res.*, 29:693, October 1941.

J. E. GILDA.

Derangements of Deciduous Dentition

By J. SCHWARTZMAN

DISTURBANCES associated with the eruption of deciduous teeth were present in ninety-eight (25.9 per cent) of 378 private cases and fifty-five (0.37 per cent) of 14,950 hospital cases. The diagnosis of dentition disturbances was made only after all other possibilities had been eliminated and then only when the derangements cleared up on eruption of the teeth in question. The effects were varied and might involve any system of the body, especially the respiratory, gastrointestinal and nervous systems. Females were affected to a greater extent in the private series, but no sex differences were noted in the hospital group. The greatest number of cases occurred in the winter and spring. More than 85 per cent of cases were noted in children under 18 months of age. The mechanism appeared to be one of local trauma and inflammation or accompanied by reflex irritation of various organs of the body with consequent systemic symptoms.—*Arch. Pediat.*, 59:188, March 1942.

J. E. GILDA.

Dental Caries in Indian Children

By K. L. SHOURIE

IN a study of dental caries in 6,866 children ranging in age from 6 to 18 years in various parts of India, the examinations were made with a dental mirror and a probe, and the total number of teeth both deciduous and permanent was recorded. Each cavity was classified as to its extent. All extracted teeth were considered carious except when known to have been lost for other reasons. The extent of caries was then expressed in a unit comparable for all groups. The percentage free from caries was recorded as 44.5, a much higher figure than that observed in England and the United States. The accumulated caries in deciduous teeth was higher in girls than in boys, but, in permanent teeth, was the same. Urban children in all age groups showed more caries than rural children. Wheat-eaters had a slightly lower average caries figure than rice-eaters. No correlation between income and extent of caries was observed. The greatest amount of caries in permanent teeth was observed in an Anglo-Indian orphanage, where the diet was in many respects superior to that consumed by the Indian children investigated, but included bread made from refined wheat flour and fairly large quantities of sugar.—*Indian J. M. Res.*, 29:709, October 1941.

J. E. GILDA.

Calcium Deposition and Enamel Hypoplasia

By BERNHARD GOTTLIEB

THE organic matrix of the enamel is formed by the ameloblasts, and the colloidal calcium is probably produced by the stratum intermedium. It is suggested that the colloidal calcium prepared by the stratum flows in a continuous stream through the ameloblasts to the organic matrix of the enamel rods. If any interruption in this flow occurs, calcium particles of various sizes become isolated and form globules. The appearance of these globules is a sign of disturbance in the normal process of calcification. Colloidal calcium is found in degenerating ameloblasts in many cases of enamel hypoplasia. In rachitic conditions, the matrix apparently is unprepared to combine with calcium salts.

The author concludes that enamel hypoplasia is a result either of lack of formation of enamel matrix or of inability of the formed enamel matrix to take up calcium.—*J. D. Res.*, 20:549, December 1941.

JAMES T. GINN.

Findings in a Dental Survey of 354 Preparatory School Boys

By J. C. BROWN and J. R. GALLAGHER

IN an initial dental examination of 354 boys, aged 12 to 16, entering the first year class at a preparatory school in three consecutive years, and from twenty-nine states and five foreign countries, the physical and roentgenologic findings are reported with

no attempt to correlate various data or to investigate the causes of caries susceptibility.

The parents of these students had incomes much higher than that of the general population. It was found that members of the low income group showed a greater number of unfilled lesions and total present areas of caries than did those of the higher income group. The incidence of extracted teeth was 0.15 per student and the number of unfilled lesions in the dentin was approximately two. The average number of filled surfaces was eleven per student, and about 18 per cent of the students were found to require immediate dental care. Normal occlusion was found in 53 per cent of the boys and 12 per cent were advised to seek orthodontic treatment.

The authors conclude that a careful dental examination as a part of the yearly routine medical examination of preparatory school boys is a desirable procedure.—*J. D. Res.*, 20:511, December 1942. JAMES T. GINN.

Prevalence of Tooth Root Exposure and the Relation of the Extent of Such Exposure to the Degree of Abrasion in Different Age Classes

By P. C. KITCHIN

A STUDY of the teeth of 200 persons in a dental college clinic was made. The occurrence of cervical exposure of cementum or dentin was found to vary from 15.5 per cent of all teeth in the 20-29 year class to 57.7 per cent of the teeth in the 50-59 year class. The linear extent of exposure increased with increasing age. Women showed less exposure than men of the same age group.

Abrasion of some extent was found in the mouths of 42 per cent of those in the 20-29 year group. Patients in the 30-39 year group showed approximately the same amount of abrasion, but had a higher percentage of deep cuts. The peak condition was observed in the 40-49 year group, since abrasion of all types reached 76 per cent.

In selected patients showing good oral hygiene, a cervical exposure of 0.5 mm. was found to be more likely to be accompanied by no abrasion than it was to be associated with abrasion. The lowest linear measure of exposure (critical exposure) generally associated with some degree of abrasion was 1.0 mm.

Comparison of conditions in good and poor hygiene groups indicated that true abrasion had not been confused to any appreciable degree with loss of tooth structure through some other agency, such as erosion. In both the good and the poor hygiene groups, areas receiving more brushing showed progressively increased abrasion. In comparable tooth groupings, in the good and poor hygiene classes, the good hygiene cases exhibited about twice the percentage of abraded conditions as did the poor hygiene.

It was determined that 58 per cent of the persons in the 20-29 year class, 84 per cent of those in the 30-39 year class, and 96 per cent of those beyond 40 years had exposure conditions in one or more teeth capable of developing abrasion under conditions favoring such development.—*J. D. Res.*, 20:565, December 1941. V. H. POWELL.

Neonatal Thrush in a Maternity Hospital

By G. B. LUDLAM and J. L. HENDERSON

THE authors believe that the high incidence of thrush and the considerable number of fatalities resulting from it are not sufficiently appreciated. Bacteriologic studies were found to have diagnostic value and confirmed the causative rôle of *Monilia albicans*. In the babies under observation, there were 163 cases of thrush in a group of 2,540 infants surviving more than forty-eight hours, an incidence of 6.4 per cent. During the next year, the incidence was 7.2 per cent. Between 2 and 10 days, the incidence was 4.1 per cent. It is believed that cases are frequently overlooked. The disease occurred more frequently in bottle-fed infants and those staying in the hospital for long periods, this accounting for the high incidence in premature infants. No evidence was found that debility, local trauma or prematurity predisposed to infection. Infection from the mother's vagina is not considered so common as infection from nurses, in a third of whose throats the organism was found. Pooling of breast milk is also a common cause, as is overcrowding of nurseries. Air-borne infection played little part. To prevent the disease, early isolation of infants is recommended, with maintenance of isolation after disappearance of the lesions and an improved nursing technic.—*Lancet*, 1:64, January 17, 1942. B. G. BIBBY.

Journal of Dental Research†
21:1-114, February 1942

Titles marked with an asterisk (*) are abstracted below.

Postextraction Use of Sulfanilamide, Locally. Ferdinand Griess.—3.

*Root Canal Studies: Anaerobic Cultures. Fred W. Morse, Jr., and Morton F. Yates.—5.

*Postmortem Bacteriologic Studies of Different Areas of Human Teeth and Their Supporting Structures. Lester W. Burket.—9.

*Blood Findings on Twenty Patients Before and After Extraction of Teeth. Philip S. Faillo.—19.

*Histopathology of Incisor Teeth of Mice with Experimentally Produced Tuberculosis. Seymour J. Kreshover.—27.

*Bone Histology in Periodontal Disease. Irving Glickman and Harold Wood.—35.

*Dental Caries in Panama Canal Zone. Robert W. Chapin and C. A. Mills.—55.

*Acid Production and Tooth Decalcification by Oral Bacteria. B. G. Bibby, J. F. Volker and M. Van Kesteren.—61.

*Relation Between Incidence of Dental Caries and pH of Normal Resting Saliva. Carlton K. Swerdlove.—73.

Do Calcium and Phosphorus in Saliva Differ Significantly in Caries-Free and Active-Caries Groups? Maxwell Karshan.—83.

Human Saliva XII. Effect of Flavored Activators on Salivary Flow and Calcium and Phosphorus Composition. Hermann Becks and W. W. Wainwright.—87.

Increase in Hardness of Dentin on Drying. Victor P. Totah.—99.

Abrasion of Dental Gold Alloys. E. W. Skinner and R. L. Lasater.—103.

*Roentgen-Ray Absorption Study of Hereditary Opalescent Dentin. H. B. McCauley.—107.

Root Canal Studies: Anaerobic Cultures.—In studies of the bacteriology of root canals, a considerable number of negative cultures are obtained on the initial opening of the root canal. It seems probable that anaerobic cultures might give a higher percentage of positive results. With several types of media developed by J. H. Brewer containing sodium thioglycollate, with methylene blue 1:500,000 as an indicator, duplicate cultures were made from root canals to compare anaerobic media with the old type of media used as a control. A 1 per cent dextrose (pH 7.6) broth was used as a control and the media tested included dehydrated thioglycollate medium, a 1 per cent dextrose infusion thioglycollate medium, 0.5 per cent dextrose infusion thioglycollate and dehydrated brain heart infusion without thioglycollate.

The total number of anaerobic cultures taken was 153, of which forty-three were positive and 110 negative.

The 0.5 per cent dextrose infusion broth containing 0.1 per cent sodium thioglycollate gave thirteen positive cultures as compared with ten positive cultures each for the other three types of anaerobic medium. In a series of forty-four teeth, anaerobic cultures showed sixteen positive and twenty-eight negative results, whereas the aerobic controls showed twenty-two positive and twenty-two negative. Aerobic methods apparently give a greater number of positive cultures.

Postmortem Bacteriologic Studies of Different Areas of Human Teeth and Their Supporting Structures.—Postmortem cultures taken from different areas in fifty-four human beings were compared with the bacteriologic studies of the blood stream and viscera. A similarity in respect to the frequency of positive growths and the types of organisms recovered was observed in the cultures from the periapex and the root apex with its pulp. Examinations of the coronal pulp and dental periosteum obtained midway between the apex and marginal gingiva rarely yielded bacteria. While the results of these few observations permit no definite conclusions as to the avenue by which bacteria may gain access to the periapical region of teeth without marked carious areas or periodontoclasia, evidence points to the blood stream as a factor of significance.

Blood Findings on Twenty Patients Before and After Extraction of Teeth.—Extraction of teeth is associated with a general blood disturbance, proof being obtained from varied tests made immediately after extraction and continuing for a six-hour period. Bacteremia was noted in 40 per cent of cases, emphasizing the proper physical evaluation of the person having teeth extracted. Immediately after each extraction, leukopenia was in evidence. In some cases, this lasted for six hours before the usual leukocytosis developed. Bacteriologic results were positive in 45 per cent of cases. When

†Through the courtesy of the American Association of Dental Editors.

the electric cautery was used around the gingival attachment of the teeth prior to extraction, root apices were negative on culture. The necessary blood specimens were obtained from patients hospitalized in the U. S. Veterans' Hospital, Hines, Ill., where observation of blood changes was possible.

Histopathology of Incisor Teeth of Mice with Experimentally Produced Tuberculosis.—References to experimental studies dealing with the relationship of tuberculosis to tooth development have not been found in the literature. In the present study, the incisor teeth of seventy mice with experimentally produced tuberculosis were studied. Definite changes were observed in the ameloblasts and subjacent surface of the organic enamel matrix. An additional group of thirteen uninoculated mice, kept in contact with their tuberculous parents for a four-week postnatal period and then isolated for another four weeks, failed to show any dental abnormalities. No dental changes were observed in twenty-two mice which served as controls. The characteristic lesions observed were irregularity and vacuolization of the ameloblasts with pyknosis and karyolysis of the nuclei, and a deposition of enamel-like droplets of varying size subjacent to the injured ameloblastic layer. A further change was the abnormal formation of a second layer of tall columnar cells underlying the ameloblasts.

Bone Histology in Periodontal Disease.—A histologic study was made of the jaws and ribs and vertebrae obtained at necropsy in four cases which presented different degrees of periodontal bone loss and inflammation. Bone findings adjacent to the periodontal membrane were compared with those observed deeper in the jaws and in the ribs and vertebrae. The following conclusions are suggested by this limited study: Inflammation is not prerequisite for the destruction of alveolar bone. Both bone formation and bone resorption may occur in association with periodontal inflammation. The predominant tendency toward bone formation or bone resorption exhibited adjacent to the periodontal membrane is simultaneously paralleled in the remainder of the jaw and other regions in the skeletal system in the individual case. No special types of bone change were found which were peculiar to the bone in the vicinity of the teeth or were pathognomonic of periodontoclasia (pyorrhea). Periodontoclasia is not a specific type of bone disease, nor can it be classified into different types on the basis of bone changes.

Dental Caries in Panama Canal Zone.—A careful survey of caries in school children of the Canal Zone, patterned after the one conducted by the U. S. Public Health Service a few years ago, has revealed a serious situation. Caries in Zone-born children is fully as frequent as in children in any northern city. It is least severe in children who have resided in the Zone less than a year, and increases as the residence there is prolonged. Discussion is offered of the various conditions which may be responsible, with particular emphasis on the water supply (entirely from Gatum Lake).

Acid Production and Tooth Decalcification by Oral Bacteria.—Cultural estimates of the numbers of acidogenic organisms in saliva from mouths with active caries indicated that lactobacilli were a minor constituent of the oral flora. Comparisons of the rate of acid formation by various mouth organisms showed that streptococci and actinomyces-like organisms formed acid most rapidly, and that lactobacilli and other organisms were less active in this respect. Some streptococcal strains formed acid more rapidly than others. The addition of enamel or dentin to cultures of oral bacteria influenced differently the amounts of acid formed, the result apparently depending on the pH at which the bacterial enzymes act. The streptococci fell into two groups, one forming more and the other less acid in the presence of tooth substance. The pH cultures containing enamel or dentin never fell below 5, indicating that this is the critical point for tooth decalcification. The amount of tooth tissue dissolved in cultures was directly proportional to the titratable acidity. The solubilities of various types of enamel and dentin in bacterial cultures paralleled those observed in acid solutions.

Relation Between Incidence of Dental Caries and pH of Normal Resting Saliva.—The coefficient of correlation between salivary acidity and the incidence of dental caries of 351 students was determined and found to be −0.06. Starr's method was used to determine the pH of the normal resting saliva. The incidence of dental caries

was computed by Bodecker's method from dental records. To check the accuracy of the pH determinations, four specimens of unknown saliva were distributed to twenty-three students for independent determinations. The standard deviations of these four specimens were 0.13, 0.10, 0.08 and 0.08 respectively, which showed low individual error in the pH readings.

As a further check, ninety-four determinations were repeated two days later. The adequacy of the sampling was determined by plotting the individual pH readings and the distribution of the caries indices against their respective frequencies. Both graphs showed normal distribution tendencies. After further checking with Fisher's test of "t," no relation between the incidence of dental caries in 351 students and the pH of normal resting saliva was evident.

Bacteria of the Mouth and Pharynx

By A. H. FINKE

IN studying bacteria in disease, it is of considerable importance to have a clear idea of the morphologic and cultural characteristics of forms frequently encountered in different parts of the human body under normal conditions. The saliva of the mouth and pharynx is a basis for a fluid medium which furnishes water as a solvent and a reaction agent suitable for a great many diffent bacteria. It is believed that catarrhal inflammation, which is rarely entirely absent, favors the lodgment of bacteria upon the membranes and reduces the resistance to the tissues. It is surprising that the frequent accidental injury of the gums and oral pharyngeal mucous membranes so rarely leads to serious infection and ends so quickly, a fact which as yet has not been explained. *Staphylococcus aureus* and *Staphylococcus albus* variety, the cause of abscesses, boils and surgical suppuration, are species of interest always found in the oral cavity.

Group IV pneumococci have been found the cause of about 9.8 per cent of types of pneumonia. Other and more virulent types may be found in the normal mouth, but are apt to represent contact with recent carriers. It is not possible at the present time to base the diagnosis of true influenza upon the isolation of the Pfeiffer bacillus, which had been done until the outbreak of the last epidemic. There is evidence that a definite influenza bacillus is the primary cause, but as yet it has not been found.

In Vincent's infection, there has been a long-continued controversy on the question as to whether fusiform bacilli develop into spirochetes and spirochetes into fusiform bacilli. Smith suggests that the fusiform organism exists in different forms and that investigators have been studying one or the other of different types of these organisms. Leptothrix found in the normal mouth is believed to be a true bacillus rather than leptothrix. Pathogenic species have been isolated from inflamed mouths and other sources. This genus needs reinvestigation.—*Wisconsin D. J.*, 18:3, January-February 1942.

Roentgen Ray Absorption Study of Hereditary Opalescent Dentin.—By a densitometric method, it was found that the dentin of fifteen teeth from a case of odontogenesis imperfecta on the average absorbed x-radiation equivalent to 0.74 mm. of pure aluminum per millimeter of tissue thickness. This figure, which was 22 per cent less than the average aluminum absorption value previously determined for normal dentin, reflected a decreased inorganic content (especially calcium) in the dentin of opalescent teeth. A calculated absorption equivalent for opalescent dentin based on chemical analyses of normal and opalescent dentitions, differed by less than 10 per cent from the experimental average. As in the case of normal dentin, coronal opalescent dentin consistently absorbed more x-radiation than root dentin. Attrition appeared to cause an increase in the absorption of the roentgen rays. No significant differences were found between the absorption values for anterior and posterior or for maxillary and mandibular dentitions. The enamel of normal and of opalescent teeth absorbed the roentgen rays in like degree.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

AMERICAN ACADEMY OF RESTORATIVE DENTISTRY, Boston, Mass., August 23-23.

AMERICAN DENTAL ASSISTANTS ASSOCIATION, Boston, Mass., August 24-28.

AMERICAN DENTAL ASSOCIATION, Boston, Mass., August 24-28.

AMERICAN DENTAL HYGIENISTS' ASSOCIATION, Boston, Mass., August 24-28.

AMERICAN SOCIETY OF ORAL SURGEONS AND EXODONTISTS, Boston, Mass., August 20-22.

CLEVELAND (OHIO) DENTAL SOCIETY, May 4-6.

DENTISTS IN INDUSTRY, Boston, Mass., August.

DISTRICT OF COLUMBIA DENTAL SOCIETY, second and fourth Tuesdays in each month, from October to June at the United States Public Health Service Auditorium, Washington.

MONTREAL (CANADA) DENTAL CLUB FALL DENTAL CLINIC, September 23-25.

NATIONAL BOARD OF DENTAL EXAMINERS, May 4-5.

NEW YORK SOCIETY OF ORTHODONTISTS, New York, November 9-10.

NEW YORK STATE SOCIETY OF DENTISTRY FOR CHILDREN, New York, May 15.

WOMEN'S DENTAL SOCIETY OF NEW YORK, New York, May 20.

ONTARIO DENTAL ASSOCIATION, Toronto, May 18-21.

DENTAL ALUMNI SOCIETY, UNIVERSITY OF PENNSYLVANIA, Philadelphia, May 14-16.

PHILADELPHIA DENTAL COLLEGE ALUMNI SOCIETY, Philadelphia, May 20.

ALUMNI ASSOCIATION, ST. LOUIS UNIVERSITY DENTAL SCHOOL, St. Louis, May 24-27.

WESTERN RESERVE DENTAL ALUMNI ASSOCIATION FIFTIETH ANNIVERSARY CELEBRATION, Cleveland, Ohio, June 8.

STATE SOCIETIES

May

Arkansas, at Little Rock (18-20)
Georgia, at Savannah (17-20)
Illinois, at Springfield (11-14)
Indiana, at Indianapolis (18-20)
Iowa, at Des Moines (4-6)
Louisiana, at Lake Charles (7-9)
Maryland, at Baltimore (4-5)
Missouri, at St. Louis (24-27)
Montana, at Butte (7-9)
Nebraska, at Lincoln (11-13)
New Jersey, at Atlantic City (6-8)
New York, at New York (11-15)
North Carolina, at Greensboro (11-13)
North Dakota, at Jamestown (11-13)
South Carolina, at Greenville (4-6)
South Dakota, at Sioux Falls (13-15)
Tennessee, at Chattanooga (11-14)
Vermont, at Burlington (20-21)
West Virginia, at Clarksburg (18-20)

June

Colorado, at Colorado Springs (18-20)
Idaho, at Lewiston (8-10)
Maine, at Skowhegan, Lakewood (18-20)
New Hampshire, at New London (21-23)
Oregon, at Portland (25-27)
Utah, at Salt Lake City (4-6)
Wyoming, at Laramie (22-24)

September

Southern California, at Los Angeles (14-16)

November

Florida, at Tampa (9-11)
Ohio, at Cincinnati (9-11)

STATE BOARDS OF DENTAL EXAMINERS

Alabama, at Birmingham, June 15. W. A. Wood, Merchants National Bank Bldg., Secretary.

Arizona, at Phoenix, June 29-July 2. R. K. Trueblood, 25 N. Second Ave., Glendale, Secretary.

Arkansas, at Little Rock, June 22-25. Clarence W. Koch, 817 Donaghey Bldg., Little Rock, Secretary.

California, at San Francisco, May 25, and at Los Angeles, June 15. Kenneth I. Nes-

bitt, 515 Van Ness Ave., San Francisco, Secretary.

Connecticut, at Hartford, June 23-27. Clarence G. Brooks, 302 State St., New London, Recorder.

Delaware, at Wilmington, June 16-19. Charles R. Jefferis, Medical Arts Bldg., Secretary.

Florida, at Jacksonville, June 22-26. H. B. Pattishall, 351 St. James Bldg., Jacksonville, Secretary.

Indiana, at Indianapolis, May 11-15. D. Gordon Lamb, 819 Chamber of Commerce Bldg., Indianapolis, Secretary.

Kentucky, at Louisville, June 9-12. Leon M. Childers, 1312 First Nat'l Bank Bldg., Lexington, Secretary.

Maine, at Augusta, June 22-24. Carl W. Maxfield, 31 Central St., Bangor, Secretary.

Massachusetts, June 15-18. Francis M. Cahill, 413-N State House, Boston.

Mississippi, at Jackson, June 16-18. G. L. Clement, Pontotoc, Secretary.

Montana, at Helena, second Monday in July. D. H. McCauley, Laurel, Secretary.

Nebraska, at Lincoln, June 8-13. H. C. Merchant, 1229 Medical Arts Bldg., Omaha, Secretary.

New Jersey, June 29-July 4. W. A. Wilson, 150 East State St., Trenton, Secretary.

New Mexico, at Santa Fe, June 15-18. J. J. Clarke, Artesia, Secretary.

North Carolina, at Raleigh, June 22. Wilbert Jackson, Rich Bldg., Clinton, Secretary.

North Dakota, at Fargo, July 13-16. L. I. Gilbert, 401 Black Bldg., Fargo, Secretary.

Ohio, at Columbus, June 22. Earl D. Lowry, 79 E. State St., Columbus, Secretary.

Oklahoma, at Oklahoma City, June 15-18. W. T. Longwell, First Nat'l Bank Bldg., Frederick, Secretary.

Pennsylvania, at Philadelphia and Pittsburgh, June 16-20. Reuben E. V. Miller, 61 N. Third St., Easton.

South Carolina, at Columbia, June 11-13. T. C. Sparks, 1508 Washington St., Columbia, Secretary.

South Dakota, at Sioux Falls, June 21-24. T. E. Burrington, Rapid City, Secretary.

Texas, at Houston, June 15-19. Carl C. Hardin, Jr., 604 Littlefield Bldg., Austin.

Vermont, at Montpelier, June 22-24. C. I. Taggart, 139 Bank St., Burlington, Secretary.

West Virginia, at Charleston, June 29-July 2. R. H. Davis, 510 Goff Bldg., Clarksburg, Secretary.

Wisconsin, at Milwaukee, June 1-5. Stephen F. Donovan, Tomah, Secretary.

AMERICAN ACADEMY OF RESTORATIVE DENTISTRY

THE Fifteenth Annual Meeting of the American Academy of Restorative Dentistry will be held in Boston, Mass., August 22-23, with headquarters at the Copley Plaza Hotel.

W. S. TUCKER, *Secretary,*
940 Canal Bldg.,
New Orleans, La.

AMERICAN DENTAL ASSISTANTS ASSOCIATION

THE eighteenth annual session of the American Dental Assistants Association will be held in Boston, Mass., August 24-28. For further information, address

AILEEN M. FERGUSON,
General Secretary,
709 Centre St.,
Jamaica Plain, Mass.

AMERICAN DENTAL HYGIENISTS' ASSOCIATION

THE nineteenth annual meeting of the American Dental Hygienists' Association will be held in Boston, Mass., August 24-28, with headquarters in the Sheraton Hotel.

A. REBEKAH FISK, *Secretary,*
General Dispensary, U. S. Army,
Washington, D. C.

AMERICAN SOCIETY OF ORAL SURGEONS AND EXODONTISTS

THE twenty-fourth annual meeting of the American Society of Oral Surgeons and Exodontists will be held in Boston, Mass., August 20-22, with headquarters in the Copley Plaza Hotel.

HARRY BEAR, *Secretary,*
410 Professional Bldg.,
Richmond, Va.

CLEVELAND DENTAL SOCIETY

THE annual Spring Clinic Meeting of the Cleveland (Ohio) Dental Society will be held May 4-6 at the Statler Hotel, Cleveland.

ALBIUN F. SADD, *Chairman,*
Publicity Committee,
562 Rose Bldg.,
Cleveland, Ohio.

DENTISTS IN INDUSTRY

A MEETING of dentists interested in industrial hygiene will be held during the annual meeting of the American Dental Association in Boston in August for the purpose of organization. For details, address

R. M. WALLS, *Chairman,*
Committee on Economics,
48 E. Market St.,
Bethlehem, Pa.

MONTREAL DENTAL CLUB

THE Eighteenth Annual Fall Clinic of the Montreal Dental Club will be held September 23-25 at the Mount Royal Hotel.

W. S. SWETNAM, *Secretary,*
1410 Guy St.,
Montreal, Canada.

NATIONAL BOARD OF DENTAL EXAMINERS

THE National Board of Dental Examiners will hold its next session for the examination of candidates in Parts I and II, May 4-5, in schools where there are five or more candidates. For further information and application blanks, address

MORTON J. LOEB, *Secretary,*
66 Trumbull St.,
New Haven, Conn.

NEW YORK SOCIETY OF ORTHODONTISTS

THE next meeting of the New York Society of Orthodontists will be held at the Waldorf-Astoria Hotel, New York, November 9-10.

NORMAN L. HILLYER, *Secretary,*
Professional Bldg.,
Hempstead.

NEW YORK STATE SOCIETY OF DENTISTRY FOR CHILDREN

THE next annual meeting and luncheon of the New York State Society of Dentistry for Children (component of the American Society of Dentistry for Children) will be held at the Pennsylvania Hotel, New York, May 15, at 12:30 p.m. The speaker will be Jack M. Wisan, president-elect of the American Society of Dentistry for Children. The Section on Dentistry for Children of the Second District Dental Society will act as host to the out-of-town members. After the meeting, there will be a tour of the Guggenheim Clinic and School for Dental Hygienists. John Oppie McCall, director, will discuss "Dental Diseases in Children's Mouths."

CARROLL M. LARSON, *Secretary,*
228 Flatbush Ave.,
Brooklyn.

WOMEN'S DENTAL SOCIETY OF NEW YORK

THE second 1942 quarterly meeting of the Women's Dental Society of New York will be held May 20 at 8 p.m., at the Pennsylvania Hotel, New York.

MATILDE FREUND,
Publicity Chairman,
CHARLOTTE BRICKNER,
Secretary,
2410 Kings Highway,
Brooklyn.

ONTARIO DENTAL ASSOCIATION

THE seventy-fifth annual convention of the Ontario Dental Association will be held at the Royal York Hotel, Toronto, May 18-21. Dentists from the United States and all parts of Canada will be welcome.

EDMUND A. GRANT, *President.*

DENTAL ALUMNI SOCIETY, UNIVERSITY OF PENNSYLVANIA

THE Dental Alumni Society of the University of Pennsylvania will meet May 14-16. Golf will be played May 14 at the Overbrook Country Club (John B. Price, 6013 Greene St., Philadelphia, chairman). May 15, at 11 a.m., the annual meeting of the Dental Alumni Society will be held at the Evans Institute, with luncheon at noon in the institute to all returning alumni, the Dental Alumni Society acting as host. At 6:30, the annual dinner will be held at the Hotel Benjamin Franklin (Howard K. Mathews, 235 S. Fifteenth St., Philadelphia, chairman); $3 per cover. May 16 will be general alumni day, with assembly in the area between College Hall and Houston Hall, luncheon in Houston Hall and a parade to Franklin Field, where the undergraduate Military and Navy R. O. T. C. units will give a demonstration and review, followed by a double header baseball game, Pennsylvania vs. Princeton, on the River Field.

J. P. LOOBY, *Chairman,*
Publicity Committee.

PHILADELPHIA DENTAL COLLEGE ALUMNI SOCIETY

THE Seventy-Ninth Annual Sessions of the Alumni Society of the Philadelphia Dental College (Temple University) will be held May 20.

DAVID K. WALDMAN,
Chairman of Publicity.

ALUMNI ASSOCIATION, ST. LOUIS UNIVERSITY DENTAL SCHOOL

THE annual meeting of the Alumni Association of the Dental School of St. Louis University will be held during the convention of the Missouri State Dental Association at the Jefferson Hotel, St. Louis, May 24-27. May 25 has been set aside for the alumni clinics and for the selection of the winner of the St. Apollonia Award. Announcement of the award is to be made at the annual banquet May 26. Open house will be held at the dental school during the state dental meeting.

OTTO C. HERMANN, *Chairman*
Press and Publicity Committee.

WESTERN RESERVE DENTAL ALUMNI ASSOCIATION

THE Western Reserve Dental Alumni Association announces the Fiftieth Anniversary Celebration, June 8. The alumni clinic, class reunions and dinner will be held at the Mid Day Club.

JOSEPH R. GOULD, *Secretary,*
630 Rose Bldg.,
Cleveland, Ohio.

ARKANSAS STATE DENTAL ASSOCIATION

THE next annual meeting of the Arkansas State Dental Association will be held at Little Rock, May 18-20.

I. M. STERNBERG, *Secretary,*
Merchants Bank Bldg.,
Fort Smith.

SOUTHERN CALIFORNIA STATE DENTAL ASSOCIATION

THE next annual meeting of the Southern California State Dental Association will be held at the Los Angeles Biltmore Hotel, September 14-16.

ROBERT L. BORLAND, *Secretary,*
602 Chapman Bldg.,
Los Angeles.

COLORADO STATE DENTAL ASSOCIATION

THE next annual meeting of the Colorado State Dental Association will be held at the Broadmoor, Colorado Springs, June 18-20.

C. K. PHILLIPS, *Secretary,*
529 Majestic Bldg.,
Denver.

FLORIDA STATE DENTAL SOCIETY

THE next annual meeting of the Florida State Dental Society will be held at Tampa, November 9-11.

W. P. WOOD, JR., *Secretary,*
442 W. Lafayette St.,
Tampa.

GEORGIA DENTAL ASSOCIATION

THE next annual meeting of the Georgia Dental Association will be held at the Hotel DeSoto, Savannah, May 17-20.

R. H. MURPHY, *Secretary,*
920 Persons Bldg.,
Macon.

IDAHO STATE DENTAL ASSOCIATION

THE next annual meeting of the Idaho State Dental Association will be held June 8-10 at Lewiston.

REX W. BARSTOW, *Secretary,*
Moscow.

ILLINOIS STATE DENTAL SOCIETY

THE Illinois State Dental Society will hold its next annual meeting May 11-14 at Springfield.

L. H. JACOB, *Secretary,*
634 Jefferson Bldg.,
Peoria.

INDIANA STATE DENTAL ASSOCIATION

THE next annual meeting of the Indiana State Dental Association will be held May 18-20 at the Claypool Hotel, Indianapolis.

E. E. EWBANK, *Secretary,*
Kingman.

IOWA STATE DENTAL SOCIETY

THE next annual meeting of the Iowa State Dental Society will be held at Hotel Fort Des Moines, Des Moines, May 4-6.

C. S. FOSTER, *Secretary,*
803 Dows Bldg.,
Cedar Rapids.

LOUISIANA STATE DENTAL SOCIETY

THE next annual meeting of the Louisiana State Dental Society will be held at the Charleston Hotel, Lake Charles, May 7-9.

JULIAN S. BERNHARD, *Secretary,*
419 Medical Arts Bldg.,
Shreveport.

MAINE DENTAL SOCIETY

THE next annual meeting of the Maine Dental Society will be held at Skowhegan, Lakewood, June 18-20.

EDWARD J. FITZGERALD, *Secretary,*
Boothbay Harbor.

MARYLAND STATE DENTAL ASSOCIATION

THE next annual meeting of the Maryland State Dental Association will be held at the Belvedere Hotel, Baltimore, May 4-5.

P. A. DEEMS, *Secretary,*
835 Park Ave.,
Baltimore.

MISSOURI STATE DENTAL ASSOCIATION

THE next annual meeting of the Missouri State Dental Association will be held at the Hotel Jefferson, St. Louis, May 24-27.

C. W. DIGGES, *Secretary,*
Exchange National Bank Bldg.,
Columbia.

MONTANA STATE DENTAL ASSOCIATION

THE next annual meeting of the Montana State Dental Association will be held in Butte, May 7-9.

T. T. RIDER, *Secretary,*
9 Higgins Block,
Missoula.

NEBRASKA STATE DENTAL ASSOCIATION

THE next annual meeting of the Nebraska State Dental Association will be held at the Cornhusker Hotel, Lincoln, May 11-13.

C. A. BUMSTEAD, *Secretary,*
Stuart Bldg.,
Lincoln.

NEW HAMPSHIRE DENTAL SOCIETY

THE next annual meeting of the New Hampshire Dental Society will be held at the Soo Nipi Park Lodge, New London, June 21-23.

FLOYD E. WILLIAMS, *Secretary,*
814 Elm St.,
Manchester.

NEW JERSEY STATE DENTAL SOCIETY

THE next annual meeting of the New Jersey State Dental Society will be held at the Ambassador Hotel, Atlantic City, May 6-8.

F. K. HEAZELTON, *Secretary,*
223 E. Hanover St.,
Trenton.

DENTAL SOCIETY OF THE STATE OF NEW YORK

THE next annual meeting of the Dental Society of the State of New York will be held at the Hotel Pennsylvania, New York, May 11-15.

CHARLES A. WILKIE, *Secretary,*
1 Hanson Place,
Brooklyn.

NORTH CAROLINA DENTAL SOCIETY

THE next annual meeting of the North Carolina Dental Society will be held at the O'Henry Hotel, Greensboro, May 11-13.

E. M. MEDLIN, *Secretary,*
Aberdeen.

NORTH DAKOTA STATE DENTAL ASSOCIATION

THE next annual meeting of the North Dakota State Dental Association will be held in Jamestown, May 11-13.

W. D. TOEPKE, *Secretary,*
New Salem.

OHIO STATE DENTAL SOCIETY

THE next annual meeting of the Ohio State Dental Society will be held at the Netherland-Plaza Hotel, Cincinnati, November 9-11.

EDWARD C. MILLS, *Secretary,*
255 E. Broad St.,
Columbus.

OREGON STATE DENTAL ASSOCIATION

THE next annual meeting of the Oregon State Dental Association will be held at Portland, June 25-27.

F. W. HOLLISTER, *Secretary,*
Selling Bldg.,
Portland.

SOUTH CAROLINA STATE DENTAL ASSOCIATION

THE next annual meeting of the South Carolina State Dental Association will be held in Greenville, May 4-6.

P. B. HAIR, *Secretary,*
Spartanburg.

SOUTH DAKOTA STATE DENTAL SOCIETY

THE next annual meeting of the South Dakota State Dental Society will be held in Sioux Falls, May 13-15.

ERNEST W. ELMEN, *Secretary,*
Sioux Falls.

TENNESSEE STATE DENTAL ASSOCIATION

THE next annual meeting of the Tennessee State Dental Association will be held at the Hotel Patten, Chattanooga, May 11-14.

HOWARD M. TAYLOR, *Secretary,*
202 Medical Art Bldg.,
Knoxville.

UTAH STATE DENTAL ASSOCIATION

THE Utah State Dental Association will hold its next annual meeting at the Newhouse Hotel, Salt Lake City, June 4-6.

S. KENNETH ROBINS, *Secretary,*
Medical Arts Bldg..
Salt Lake City.

VERMONT STATE DENTAL SOCIETY

THE next annual meeting of the Vermont State Dental Society will be held in Burlington, May 20-21.

J. GILLAM IRONS, *Secretary,*
Bennington.

WEST VIRGINIA STATE DENTAL SOCIETY

THE next annual meeting of the West Virginia State Dental Society will be held in Clarksburg, May 18-20.

C. G. ANDERSON, *Secretary,*
Mount Hope.

WYOMING STATE DENTAL ASSOCIATION

THE next annual meeting of the Wyoming State Dental Association will be held in Laramie, June 22-24.

J. D. MCNIFF, *Secretary,*
Laramie.

ALABAMA BOARD OF DENTAL EXAMINERS

THE Board of Dental Examiners of Alabama will conduct its next annual dental examination beginning June 15 at Birmingham. All credentials must be filed with the secretary at least two weeks in advance of the examination. Address all correspondence to

W. A. WOOD, *Secretary,*
Merchants National Bank Bldg.,
Mobile.

ARIZONA STATE DENTAL BOARD

THE Arizona State Dental Board will hold its annual examination of applicants for license to practice dentistry in Arizona, at Phoenix, June 29-July 2. All application blanks and fees must be in the hands of the secretary at least fifteeen days prior to the date of the examination. For application blanks and other information, address

R. K. TRUEBLOOD, *Secretary,*
25 N. 2nd Ave.,
Glendale.

ARKANSAS STATE BOARD OF DENTAL EXAMINERS

THE Arkansas State Board of Dental Examiners will conduct the next examination of applicants for dental licensure at Little Rock, June 22-25. All applications must be filed not later than June 10.

CLARENCE W. KOCH, *Secretary,*
817 Donaghey Bldg.,
Little Rock.

STATE OF CALIFORNIA BOARD OF DENTAL EXAMINERS

THE next examination to be conducted by the Board of Dental Examiners of California for license to practice dentistry or dental hygiene in the State of California will be held in San Francisco commencing May 25 at the Physicians and Surgeons College of Dentistry for theory and practical examinations and at the University of California, College of Dentistry for practical examina-

tions. The graduates will do the practical work at their respective colleges. At Los Angeles, in the University of Southern California, College of Dentistry, examinations will be held commencing June 15. All credentials must be in the office of the secretary at least twenty days prior to the examinations. Address all communications to

KENNETH I. NESBITT, *Secretary,*
Room 203, 515 Van Ness Ave.,
San Francisco.

CONNECTICUT DENTAL COMMISSION

THE Connecticut Dental Commission will meet in Hartford, June 23-27, for the examination of applicants for license to practice dentistry and dental hygiene and to transact any other business to come before it. Applications should be in the hands of the recorder at least ten days before the meeting. For application blanks, apply to

CLARENCE G. BROOKS, *Recorder,*
302 State St.,
New London.

DELAWARE STATE BOARD OF DENTAL EXAMINERS

THE next examination of the Delaware State Board of Dental Examiners will be held June 16-19, at the Delaware Hospital, Wilmington, at 9 a.m.

CHARLES R. JEFFERIS, *Secretary,*
Medical Arts Bldg.,
Wilmington.

FLORIDA STATE BOARD OF DENTAL EXAMINERS

THE Florida State Board of Dental Examiners will hold its annual examination of applicants for license to practice dentistry or dental hygiene, at the Seminole Hotel, Jacksonville, June 22-26. Dental candidates must file preliminary applications by April 22. Final applications of dental and dental hygiene candidates must be complete by May 2. Address all communications to

H. B. PATTISHALL, *Secretary,*
351 St. James Bldg.,
Jacksonville.

INDIANA STATE BOARD OF DENTAL EXAMINERS

THE Indiana State Board of Dental Examiners will hold its next examination for licensure in Indianapolis May 11-15. All applications, fees and credentials must be in the hands of the secretary not later than ten days prior to the beginning date of the examination. For application, instructions and other information, address

D. GORDON LAMB, *Secretary,*
819 Chamber of Commerce Bldg.,
Indianapolis.

KENTUCKY STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the Kentucky State Board of Dental Examiners will be held June 9-12 at the University of Louisville Dental School, Louisville. Dentists having graduated prior to 1942 and desiring to stand examination before this board must file applications, complete with full information requested, in this office not later than March 9. Applications of 1942 graduates must be in the secretary's office by May 9. Ample time should be allowed for securing all data required. For applications forms and further information, apply to

LEON M. CHILDERS, *Secretary,*
1312 First Nat'l Bank Bldg.,
Lexington, Ky.

MAINE STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the Maine State Board of Dental Examiners will be held June 22-24 at the State House, Augusta. Applications with the necessary fee must be in the hands of the secretary at least ten days prior to the date of the examination. Address all communications to

CARL W. MAXFIELD, *Secretary,*
31 Central St.,
Bangor.

MASSACHUSETTS BOARD OF DENTAL EXAMINERS

THE Massachusetts Board of Dental Examiners will hold its next annual examination June 15-18. All credentials must be filed with the secretary at least thirty days in advance. For further information, address

FRANCIS M. CAHILL, *Secretary,*
413-N State House,
Boston.

MISSISSIPPI STATE BOARD OF DENTAL EXAMINERS

THE Mississippi State Board of Dental Examiners will hold its annual examination of applicants for license to practice dentistry

or dental hygiene at the state capitol, Jackson, June 16-18. Address communications to

G. L. CLEMENT, *Secretary,*
Pontotoc.

MONTANA STATE BOARD OF DENTAL EXAMINERS

A MEETING of the Montana State Board of Dental Examiners will be held in Helena on the second Monday in July. All applications for examinations must be in the hands of the secretary not later than twenty days previous to the opening of the examination and must be sworn to before a notary public.

D. H. MCCAULEY, *Secretary,*
Laurel.

NEBRASKA STATE BOARD OF DENTAL EXAMINERS

THE next regular meeting of the Nebraska State Board of Dental Examiners will be held June 8-13 at the University of Nebraska Dental School, Lincoln.

H. C. MERCHANT, *Secretary,*
1229 Medical Arts Bldg.,
Omaha.

STATE BOARD OF REGISTRATION AND EXAMINATION IN DENTISTRY OF NEW JERSEY

THE State Board of Registration and Examination in Dentistry of New Jersey will hold its annual examinations commencing Monday, June 29 and continuing for five days thereafter. On application to the secretary, a copy of the requirements and rules for applicants, instruction sheet and preliminary application blank will be sent. Any person desiring to become a candidate must file the preliminary application, together with the examination fee of $25, on or before March 15 for the succeeding June examinations or before September 1 for the succeeding December examinations.

W. A. WILSON, *Secretary,*
150 East State St.,
Trenton.

NEW MEXICO BOARD OF DENTAL EXAMINERS

THE New Mexico State Board of Dental Examiners will hold its next examination June 15-18 at Santa Fe.

J. J. CLARKE, *Secretary,*
Artesia.

NORTH CAROLINA STATE BOARD OF DENTAL EXAMINERS

THE next annual meeting of the North Carolina State Board of Dental Examiners for the examination of applicants for licensure will be held at the State Capitol, Raleigh, beginning June 22. Applications must be filed with the secretary thirty days before the examination. For application blanks and further information, address

WILBERT JACKSON, *Secretary,*
Rich Bldg.,
Clinton.

NORTH DAKOTA STATE BOARD OF DENTAL EXAMINERS

THE North Dakota State Board of Dental Examiners will hold its next examination in the Gardner Hotel, Fargo, July 13-16. For further information and application blank, address

L. I. GILBERT, *Secretary,*
401 Black Bldg.,
Fargo.

OHIO STATE DENTAL BOARD

THE next examination of the Ohio State Dental Board will be held at Ohio State University, College of Dentistry, Columbus, the week beginning June 22. All applications must be in the hands of the secretary at least ten days before the examination. For further information, address

EARL D. LOWRY, *Secretary,*
79 E. State St.,
Columbus.

STATE OF OKLAHOMA BOARD OF GOVERNORS OF REGISTERED DENTISTS

THE Board of Governors of Registered Dentists of the State of Oklahoma will hold its next examination in Oklahoma City, June 15-18. Final application for examinations in dentistry, dental hygiene and dental specialties must be complete by June 10.

W. T. LONGWELL, *Secretary,*
First National Bank Bldg.,
Frederick.

DENTAL COUNCIL AND EXAMINING BOARD OF THE COMMONWEALTH OF PENNSYLVANIA

THE Dental Council and Examining Board of the Commonwealth of Pennsylvania will conduct examinations in Philadelphia and

Pittsburgh, June 16-20. For further information and application blanks, address the Department of Public Instruction, Bureau of Professional Licensing, Dental Division, Harrisburg.

REUBEN E. V. MILLER, *Secretary*,
61 N. 3rd St.,
Easton.

SOUTH CAROLINA STATE BOARD OF DENTAL EXAMINERS

THE South Carolina State Board of Dental Examiners will hold its next annual meeting at Columbia, June 11-13.

T. C. SPARKS, *Secretary*,
1508 Washington St.,
Columbia.

SOUTH DAKOTA STATE BOARD OF DENTAL EXAMINERS

A MEETING of the South Dakota State Board of Dental Examiners will be held at the Carpenter Hotel, Sioux Falls, June 21-24. For further information or application forms, address

T. E. BURRINGTON, *Secretary*,
Rapid City.

TEXAS STATE BOARD OF DENTAL EXAMINERS

THE Texas State Board of Dental Examiners will hold an examination June 15-19 at Houston, at the Rice Hotel. For further information and application blanks, address

CARL C. HARDIN, JR.,
604 Littlefield Bldg.,
Austin.

VERMONT STATE BOARD OF DENTAL EXAMINERS

THE Vermont State Board of Dental Examiners will meet June 22-24 in the State House, Montpelier, to examine applicants for license to practice dentistry and dental hygiene. All applications, together with examination fee, must be in the hands of the secretary at least fifteen days before the date of the meeting. For applications and other information, address

C. I. TAGGART, *Secretary*,
139 Bank St.,
Burlington.

WEST VIRGINIA STATE BOARD OF DENTAL EXAMINERS

THE West Virginia State Board of Dental Examiners will hold its next examination for those desiring a license to practice dentistry or dental hygiene, at Charleston, June 29-July 2. For further information, address

R. H. DAVIS, *Secretary*,
510 Goff Bldg.,
Clarksburg.

STATE OF WISCONSIN BOARD OF OF DENTAL EXAMINERS

THE Wisconsin Board of Dental Examiners will hold its next examination at Marquette Dental School, Milwaukee, June 1-5. Examinations will be given for licensure of dentists and hygienists. All applications must be in by May 26. For application blanks and information, address

STEPHEN F. DONOVAN, *Secretary*,
Tomah.

EXAMINATION FOR APPOINTMENT IN THE DENTAL CORPS OF THE NAVY

THE next examination for appointment as assistant dental surgeon, U. S. Navy (lieutenant [junior grade], Dental Corps, U. S. Navy) will be held at the Naval Training Station, Norfolk, Va., the Naval Training Station, Great Lakes, Ill., the Naval Training Station, San Diego, Calif., and the Naval Dental School, National Naval Medical Center, Bethesda, Md., July 6. Applications for this examination should be made to the Chief of the Bureau of Medicine and Surgery, Navy Department, Washington, D. C.

Applicants for appointment as assistant dental surgeon must be citizens of the United States, more than 21 but less than 32 years of age at the time of acceptance of appointment, and graduates of a class A dental school.

A circular of information listing physical and other requirements for appointment, subjects in which applicants are examined and other data pertaining to salary, allowances, etc., can be obtained from the Bureau of Medicine and Surgery, Navy Department, Washington, D. C., on request.

LOCATIONS FOR DENTISTS

A NEED for additional dentists exists in many of the vital defense areas. These shortages have arisen because of the great increase in civilian population that has occurred during the year. At present, needs exist in a number of states in communities varying in size from small villages to large cities. A continuing increase in population will result

in overtaxing the dental personnel in many other localities where at present the dentists are very near the limit of their capacities. In many of these defense areas, there are defense housing projects in which office space or living accommodations, or both, may be secured. The United States Public Health Service in cooperation with the Division of Defense Housing of the Federal Works Agency, which supervises these projects, is interested in acquainting dentists with the needs of these communities. If you are interested in securing more specific information about localities for the establishment of practice, communicate with

THOMAS PARRAN, *Surgeon General.*

DENTAL RESIDENCIES AND INTERNSHIPS

THOSE interested in obtaining applications for the dental residencies and dental internships at the Sea View Hospital for the fiscal year commencing July 1 can obtain information from Jerome Leon, assistant medical director of the hospital, Staten Island, New York. Dental residencies offer an annual stipend of $1,200 and complete maintenance. Dental internships offer $15 monthly and complete maintenance. Sea View Hospital is the largest tuberculosis hospital in the world and offers exceptional facilities in the various phases of dentistry.

RALPH HOWARD BRODSKY, *Director*
Division of Oral Surgery,
Sea View Hospital.

DENTAL RESIDENCY

THE University of Oregon Medical School Hospitals and Clinics offers a residency in dental medicine and oral surgery, the period of service to be one year, with compensation $40 monthly, in addition to board, room and laundry. The division is under the general direction of the department of medicine and the direct supervision of the head of the division and a visiting staff of sixteen dentists. Service is carried on in the outpatient clinic and the three hospitals. Application blanks will be furnished on request. Direct inquiries to

RICHARD B. DILLEHUNT, *Dean,*
University of Oregon Medical School,
Portland.

DENTAL RESIDENTSHIP

A TWELVE months' dental residentship is available at the Western Pennsylvania Hospital, Pittsburgh, beginning July 1. The applicant for this position must be a graduate dentist holding a Pennsylvania license and having had the minimum of one year's dental internship in a recognized hospital. A salary of $83.33 per month with maintenance is offered with the position.

J. A. GARDNER, *Chief,*
Dental Department.

RESEARCH FELLOWSHIP IN MEDICINE AND DENTISTRY AT THE UNIVERSITY OF ILLINOIS

THE Graduate School of the University of Illinois has established four research fellowships to be awarded for one year in the fields of medicine and dentistry in Chicago at a stipend of $1,200 per year (calendar year with one month's vacation). Candidates for these fellowships must have completed a training of not less than eight years beyond high school graduation. This training may have been acquired in any one of the following ways, or the equivalent thereof: 1. Work leading to the B.S. and M.D. degrees. 2. Work leading to the B.S., M.S., and D.D.S. degrees. 3. Work leading to the B.S. and B.A. degrees in a four-year collegiate course and to the D.D.S. degree. 4. Work leading to the B.S., D.D.S. and M.D. degrees. The fellowship year begins September 1. Formal application blanks can be secured from the Secretary of the Committee on Graduate Work in Medicine and Dentistry, 1853 W. Polk St., Chicago, Ill.

BRONX HOSPITAL VOLUNTEERSHIPS

THE Dental Department of the Bronx Hospital offers a number of volunteerships to recent graduates in dentistry in the following branches: oral surgery and anesthesia; surgical pyorrhea; orthodontia; root canal therapy, and operative dentistry. Those offering satisfactory credentials indicating their interest in the clinical study of dental surgery as a health problem will receive consideration. Address applications to the Dental Department, Bronx Hospital, Fulton Ave. at 169th St., Bronx, New York. Appointments will begin in July.

DAVID WURZEL, *Director,*
Dental Department.

BRONX HOSPITAL DENTAL INTERNSHIP

EXAMINATION for a dental internship for one year beginning July 1 will be held April 3 at 10 a.m. at the Bronx Hospital, Fulton Avenue at 169th St., Bronx, N. Y. The Bronx Hospital is a modern institution with a capacity of 329 beds for acute diseases. It has a very active outpatient department in dentistry, including periodontia, orthodontia, oral surgery, root canal therapy and operative dentistry. Write for application form to the superintendent of the hospital.

INTERNSHIP APPOINTMENTS

THE Walter G. Zoller Memorial Dental Clinic, University of Chicago, offers four rotating internship appointments, effective July 1, 1942, to June 30, 1943. The clinic maintains four divisions of service: 1. The Zoller Clinic in Billings Hospital for general dental service. 2. The University Dental Clinic in Billings Hospital for diagnosis and minor oral surgey. 3. The Prenatal Dental Clinic in Chicago Lying-In Hospital for general service. 4. The Orthopedic Dental Clinic in the Home for Destitute Crippled Children for general dentistry. In addition to clinical practice, the intern will assist in the department of anesthesia and have the privilege of attending all departmental seminars on dentistry, medicine, pathology, etc. Those seniors interested should write immediately for application blanks to the Director, Walter G. Zoller Memorial Dental Clinic, University of Chicago, Chicago.

CARNEGIE FELLOWSHIPS FOR RESEARCH AND GRADUATE WORK IN THE DENTAL SCIENCES

AIDED by the Carnegie Corporation, the School of Medicine and Dentistry of the University of Rochester offers scholarships paying $1,200-$1,800 per annum to well-trained dental graduates who are interested in research or who desire special training in the basic medical sciences as an aid to dental teaching or practice. A few fellowships also offer part-time training in oral surgery. On appointment, the applicant is given the title of Carnegie Dental Fellow and, according to his interest, works as a graduate student in one of the departments of the medical schools. Here, excellent laboratory facilities, adequate direction and close contact with various investigations related to medicine and dentistry help his research and study. Fellows are encouraged to attend medical classes, seminars and staff meetings and, when opportunity presents itself, to participate in class instruction and scientific meetings. Contact with the problems of clinical dentistry may be maintained through the Oral Surgery Clinic of the Strong Memorial Hospital and the Rochester Dental Dispensary. With the approval of the Graduate Council of the university, Fellows may prepare themselves for the degree of M.S. or Ph.D. Applications should be made to

GEORGE H. WHIPPLE, *Dean,*
School of Medicine and Dentistry,
Rochester, N. Y.

NEW YORK UNIVERSITY COLLEGE OF DENTISTRY POSTGRADUATE COURSE

THE New York University College of Dentistry announces a postgraduate course in inhalation anesthesia with special emphasis on nitrous oxide-oxygen anesthesia, conducted by E. A. Rovenstine, professor of anesthesia, New York University College of Medicine and Bellevue Hospital, and A. S. Mecca, assistant professor of oral surgery, New York University College of Dentistry and Bellevue Hospital. The course will be given Friday mornings for six consecutive weeks beginning April 24 and ending May 30. Classes will begin at 9 a.m. and continue to 12 noon. Direct all communications to the office of the dean, New York University College of Dentistry, 209 E. 23d St., New York, N. Y.

POSTGRADUATE COURSE IN PERIODONTIA

THE New York University College of Dentistry will hold its ninth annual postgraduate course in periodontia for twenty sessions, as follows: Schedule A, morning and afternoon sessions, June 15-26. Schedule B, morning and afternoon sessions, June 15-17; mornings only, June 18-July 8. Fee $100. Course limited to fifteen men. Preference given in order of receipt of application. The course will include etiology, diagnosis and treatment of periodontal disease; various technics of pocket eradication, with conservative treat-

ment stressed; Vincent's infection; diagnosis of types of bone resorption; mouth manifestations of systemic disease; periodontal foci of infection; toothbrushing; instrumentation, diet; balancing of occlusion; taught by lectures and clinical work, each student treating several cases. Instruction by Samuel Charles Miller, Sidney Sorrin, J. Lewis Blass and the entire periodontia faculty. For further information and application, address the Office of the Dean, New York University College of Dentistry, 209 E. 23rd St., New York, N. Y.

POSTGRADUATE COURSES, COLLEGE OF DENTISTRY, OHIO STATE UNIVERSITY

THE College of Dentistry of Ohio State University, Columbus, offers postgraduate courses in dentistry that are especially designed for the general practitioner who may wish to amplify his training in any of the following fields: x-ray technic and diagnosis (course offered June 8-12); crown and bridge work (June 15-20); oral surgery (June 15-19); prosthodontia (June 15-20); operative dentistry (June 15-19), and root canal therapy (June 15-19). Periodontia will be offered one day per week for ten consecutive weeks beginning June 17. The fee for these courses is $50. A postgraduate course in orthodontics is offered on a part-time basis. The fee and length of course is determined by the scope of the student's fundamental undergraduate training in this subject. Registration in all courses is limited to ten men. It is the aim of these courses to teach new technics as well as to review fundamentals. For further information and application blanks, address the Dean, College of Dentistry, Ohio State University, Columbus, Ohio.

COLUMBIA UNIVERSITY SCHOOL OF DENTAL AND ORAL SURGERY REFRESHER COURSES

COLUMBIA University School of Dental and Oral Surgery offers two short courses in periodontia for qualified graduates in dentistry January 23 to May 22, 1942, and September 18, 1942, to January 15, 1943.

A ten-day intensive course will include lectures, discussions, demonstrations and clinical practice. An extended course, one half day per week for two sessions, will include lectures, discussions and supervised technical treatment. Both courses will be conducted by Frank E. Beube, Isador Hirschfeld, Harold J. Leonard (executive officer) and Arthur H. Merritt.

The courses given at the School of Dental and Oral Surgery, Columbia University, are designed to be "refresher" courses; i.e., to bring practitioners abreast of modern undergraduate teaching in theory and practice in the subject. Admission to the course is limited to qualified graduates in dentistry who are members in good standing of the American Dental Association or recognized sectional organizations. In the case of foreign applicants, membership in the applicant's national dental organization is required.

Information can be obtained from the registrar, School of Dental and Oral Surgery, 630 West 168th Street, New York, N. Y.

SUMMARY OF LITERATURE ON PERIODONTAL DISEASE

The Periodontia Department of New York University College of Dentistry cordially invites each investigator in the field of periodontal disease who has published a paper or papers containing the results of either laboratory research or clinical observations which bear directly or indirectly upon the etiology or treatment of periodontal disease in man or animals (1) to submit a concise summary of those of his papers which he deems to be his basic contributions to this field and which he considers to be in agreement with his present thinking, or with his experience and thinking up to a time specified by him; (2) to cite the location and time of appearance of such paper or papers which contain such basic findings, and (3) to enclose any additional statement that may seem necessary to him to amend the foregoing statements so that they more accurately reflect his present opinions.

These summaries will, therefore, contain only present opinions, rather than the total results of each worker's endeavors, which may, in addition, include errors, duplication, altering viewpoints, etc. The compilations of such summaries, which will contain

the essence of each investigator's present thinking will then be published in book form and will, therefore, not be a series of abstracts of papers on either the etiology or the treatment of periodontal disease.

The summary should be in our hands not later than July 1, 1942.

New York University, College of Dentistry.
209 East 23rd St.,
New York, N. Y.

UNITED STATES PATENTS APPLICABLE OR PERTAINING TO DENTISTRY ISSUED DURING MARCH 1942

March 3

No. 2,274,790, GEORGE L. HOUSLEY. Dispensing device.

No. 2,274,808, IRWIN C. RINN. Bite wing for dental film packs and the like.

No. 2,274,814, EARL CLAY WEST. Dental device.

No. 2,274,893, HYMAN FREEDMAN. Dental apparatus.

No. 2,275,167, WILLIAM BIERMAN. Electrosurgical instrument.

No. 2,275,247, JOHN F. CAVANAGH. Power driven toothbrush.

March 10

No. 2,275,534, ALEXANDER S. LANGSDORF. Anesthesia apparatus.

No. 2,275,549, BENJAMIN OSHMAN and JOSEPH OSHMAN. Toothbrush retainer.

No. 2,275,672, CARINA BERGAMINI BRUNI and PIETRO BRUNI. Apparatus for dry disinfection of razors, surgical instruments, and the like.

No. 2,275,726, EARLY W. BURNS and ANDREW D. HAGEN. Articulator balancer.

No. 2,276,067, IVAR E. SIQVELAND. Disk holding device.

March 17

No. 2,276,610, CHARLES ABRAHAM CLERICI. Hypodermic syringe.

No. 2,276,623, BENJAMIN WILLIAM MEIMAN. Electrical apparatus for dental sterilization.

No. 2,276,641, RAYMOND A. BALL. Toothbrush.

No. 2,276,701, GEORGE T. PUSEY, JR. Carrier for artificial teeth.

March 24

No. 2,277,038, DAVID CURTIS. Anesthetic preparation.

No. 2,277,364, SAMUEL A. HERMAN. X-ray dental film packet.

No. 2,277,370, HARRY J. SHEEDY. Bisectional lower denture.

No. 2,277,624, ALFRED H. BARTLING. Dental tray.

No. D-131,690, IVAR E. SIQVELAND. Design for a fountain toothbrush.

March 31

No. 2,277,865, LUDWIG JUROVATY. Dental floss applicator.

No. 2,278,095, LOVEN HUGH ROGERS. Electrical toothbrush.

No. 2,278,253, GEORGE C. ELLSWORTH. Dispensing device.